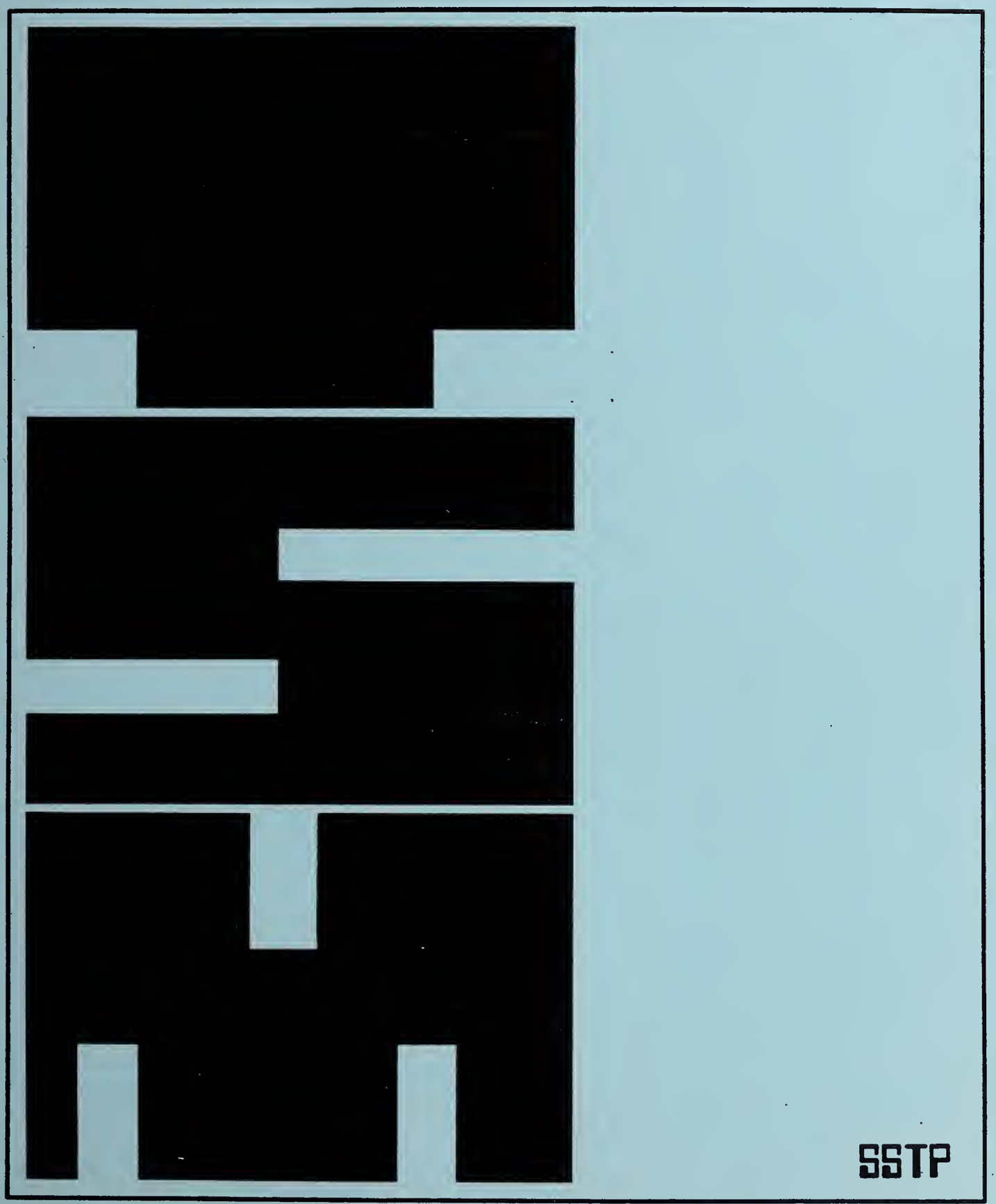
U.S. Department of Transportation

1979

Prototype Planning Study:

Middlesex County, N.J.



Prototype Planning Study:
Middlesex County, New Jersey

Final Report
1979

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A special thanks to Alan Voorhees who was the first one to suggest that a TSM Prototype Study would be worthwhile for Middlesex County.

Any errors or misinterpretations are, of course, the responsibility of the authors.

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EXECUTIVE SUMMARY

Middlesex County, New Jersey is centrally located in the heart of the New York to Philadelphia travel corridor, and is experiencing transportation problems which are shared by many other growth centers. The County is already in an area of densely developed urban and industrial centers with fast growing suburban, residential and commercial complexes, as well as the potential for large growth of rural sections.

Because of increasing industrial and commercial employment opportunities resulting from this growth, an expanding population base, and an increase in auto registrations in the County, a high volume of intra-county traffic movements occur. However, county roadways suffer from capacity problems, stemming from the fact that the highway network is predominately two-lane. Problems also occur because many of the major arterials and collectors change in capacity from section to section, creating bottlenecks and blockages.

The County decided to explore the potential of transportation systems management (TSM) to solve the traffic problems noted, without incurring high costs, or long delays. The study which was initiated had three objectives:

1. To get a TSM implementation plan to develop strategies to improve transportation efficiency in the County;

2. To suggest methods to improve the institutional relationships which affect the transportation project implementation process; and

3. To suggest any changes in TSM guidelines which would improve their applicability in the County and nationwide.

The County felt that public participation was necessary for both data collection and project implementation. Carried out at the meetings of various chambers of commerce within the study areas, these sessions elicited the chamber members' ideas on the problems of the existing transportation system and some suggested solutions. It also afforded the staff a good opportunity to determine the reaction to various strategy alternatives.

The study also included an overview of all actors involved in transportation policy making and project implementation on the local, County, State, regional and federal levels. The roles of the actors in the process were examined, as well as how they interacted. All functions of involved agencies, departments and any relevant legislation they must follow were also examined.

Transit operator opinions were solicited in the problem identification process through the use of surveys which were distributed to operators who utilized the study corridors. The County Planning Board as well as the County Engineers Office were also involved, as was the Middlesex County Transportation Coordinating Committee (TCC).

The TSM strategies investigated fell into three (3) groupings: supply oriented, transportation demand oriented and transit oriented.

Supply oriented strategies were grouped into eight (8) categories of projects. These include:

1. signing and pavement markings,
2. signal timing and coordination and signalization,
3. intersection channelization and minor physical improvements,
4. traffic operational controls,
5. parking controls,
6. private access controls,
7. moderate capital construction, and
8. miscellaneous

The supply oriented strategies, which are aimed at improving highway efficiency, appear most effective at reducing air and noise pollution, energy consumption, user travel costs and traffic accidents.

Strategies to redistribute transportation demand, in order to reduce vehicle miles of travel during the peak period, were divided into three (3) categories of actions:

1. employee carpooling and vanpooling measures,
2. rescheduling of work shifts measures, and
3. rescheduling school hours.

Demand management strategies can effectively reduce air and noise pollution, energy consumption and peak period congestion, especially in the vicinity of major employment centers.

The final group of strategies, designed to improve transit services, was divided into three (3) categories corresponding to the systems' weaknesses. They include:

1. transit marketing needs,
2. transit access improvements, and
3. paratransit services.

Transit related strategies are aimed at improving marketing and transit service for those transit lines servicing the study corridor. Overall system improvement should encourage continued use, as well as inducing auto users to try this mode of travel. Some site specific areas targeted for improvement include industrial areas, along with commercial areas and institutional centers. Through this strategy the staff anticipated that the transit system would then be more responsive to the present needs of the community.

Along with the recommended strategies, the staff developed a working implementation plan to help insure the timely development of the projects. This plan is a guide, outlining the probable time of implementation for each project, the specific responsibilities of each actor involved and an estimated cost for the projects along with possible funding source.

The County staff, after identifying problems and strategies, also developed monitoring guidelines aimed at measuring the impacts of implemented strategies as well as establishing a framework from which to analyze future needs.

Using this approach, the TSM concept appeared to provide a viable framework within which to approach the County's transportation problems in a timely, comprehensive and effective manner. The County was able to pinpoint problem areas and practical low-cost solution alternatives on the transportation systems using the TSM process. Likewise, it was able to identify the implementation process. The techniques investigated, and the approach taken to studying them, appear to have applicability in other areas having similar growth-related highway capacity problems.

TABLE OF CONTENTS

CHAPTER 1: MIDDLESEX COUNTY

A. Location

Middlesex County is centrally located in the heart of the New York to Philadelphia travel corridor. The County is only 25 miles from the Manhatten Island Central Business District (CBD) and only 45 miles from Philadelphia's CBD. This unique geographic location has made Middlesex a prime development area, attracting a great deal of business and industry along with residential growth. This evidenced by the fact that more than 20% of the nation's top 500 industries have facilities located here. Corroborating these facts, demographic data shows that while Middlesex is only of average size in land area, it ranks third of the twenty-one (21) New Jersey Counties in size of population. (See Map "A").

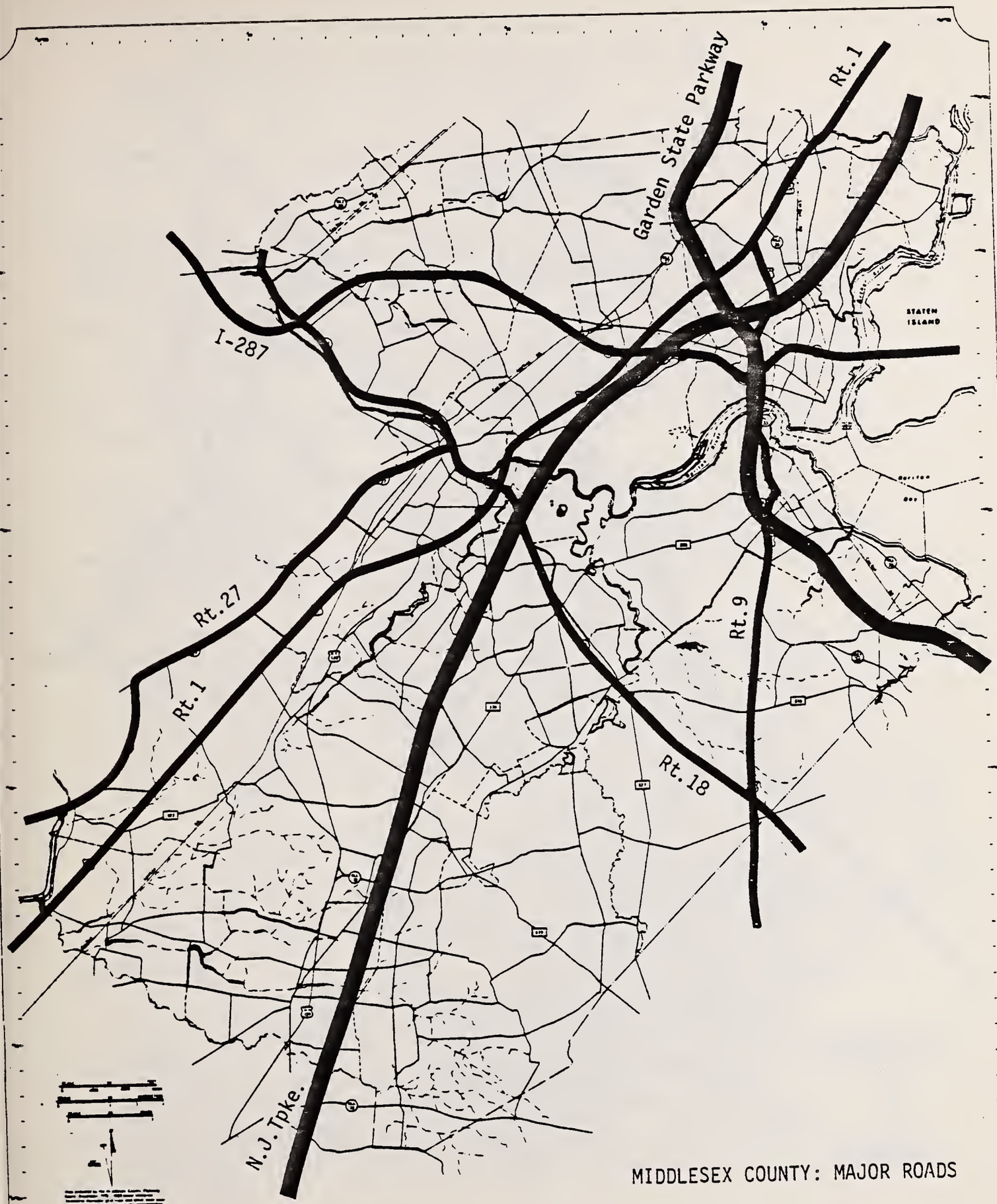
Middlesex County is at the focal point of land, sea and rail transportation serving the Eastern seaboard. Highway access to the County is provided by the New Jersey Turnpike, Garden State Parkway, Interstate Routes 95 and 287, U.S. Routes 130, 1 and 9, in addition to New Jersey State Routes 18, 27, and 35. Due to its proximity to New York, the County is well serviced by deep water shipping facilities. Furthermore, the County's rail service is provided by Amtrak and Conrail using the old Penn-Central Mainline which traverses the entire length of the County for regional commuting. Supplementing this service are the old Central Jersey, Lehigh Valley, Reading and New York and Long Branch lines. (See Maps "B,C and D").

The vast majority of these transportation facilities converge, intersect, or parallel each other closely in the northern part of the County, which serves as the gateway to the New York Metropolitan area. Development in the County, therefore, generally follows a pattern paralleling these transportation facilities throughout the County, being heaviest in the northern areas and becoming less dense in the southern half of the County where the distance between these facilities is greater.

TRANSPORTATION SYSTEM

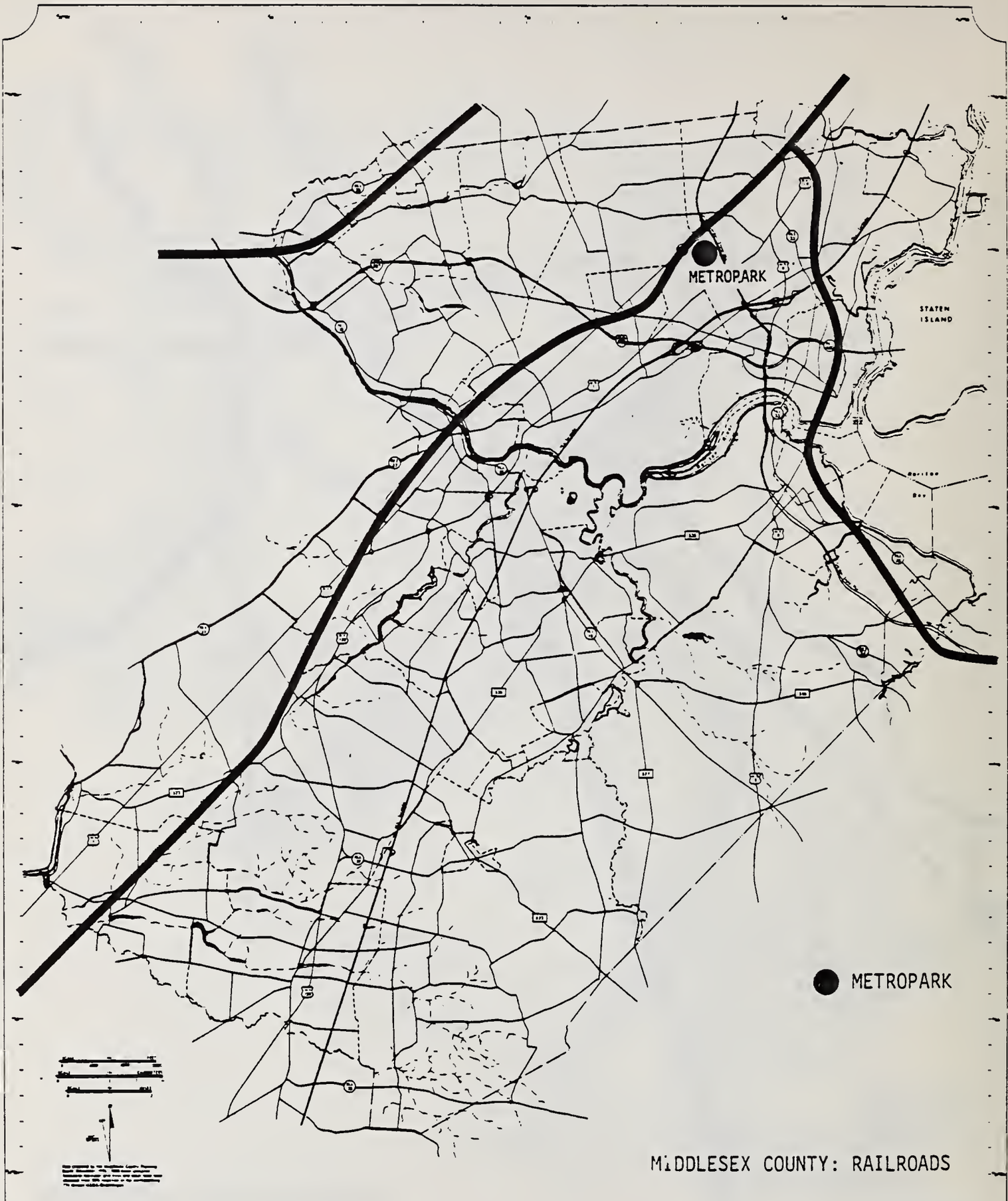
NEW JERSEY

MAP A



MIDDLESEX COUNTY: MAJOR ROADS

MAP B



MIDDLESEX COUNTY: RAILROADS

MAP C

The County Planning Board has classified Middlesex County's jurisdictions into three (3) categories for statistical purposes:

1). The "A" Ring, which represents the older urbanized, densely populated and heavily developed areas.

2). The "B" Ring, which represents the more recently developed, suburbanized and somewhat less densely settled areas, and,

3). The "C" Ring, which represents the predominantly rural, sparsely developed and high growth potential areas, mainly of the south County (See Map "D" attached).

The "A" Ring is composed mainly of cities in the northern part of the County and is most heavily developed with only 16.8% of its land area being vacant. It is predominantly residential while also having the largest percentages of commercial and industrial development in the County (See Table I-A).

The "B" Ring is made up of the suburbs which generally surround the "A" Ring Urban Areas. These areas have experienced the greatest amount of growth over the past fifteen years. Residential development has proceeded most rapidly with commercial and industrial development following. The development here is much more dispersed than the "A" Ring, however, with 35.2% of the "B" Ring land being vacant.

The vast majority of the "C" Ring land is rural in nature with 79% of the land area being made up of farmland, forest or vacant land. Therefore, this area in the extreme South County has the highest growth potential of the three categories, some of which is already beginning to be realized.

The County's general development pattern follows a North/South axis along the main travel corridor. Thus, together with the variety of land use along these corridors, the traffic generators located there and the mix of travel modes available within the corridors make Middlesex County an ideal location for a TSM prototype Planning Project. The corridor nature of the County also underscored the eventual selection of the corridor-specific approach to the study.

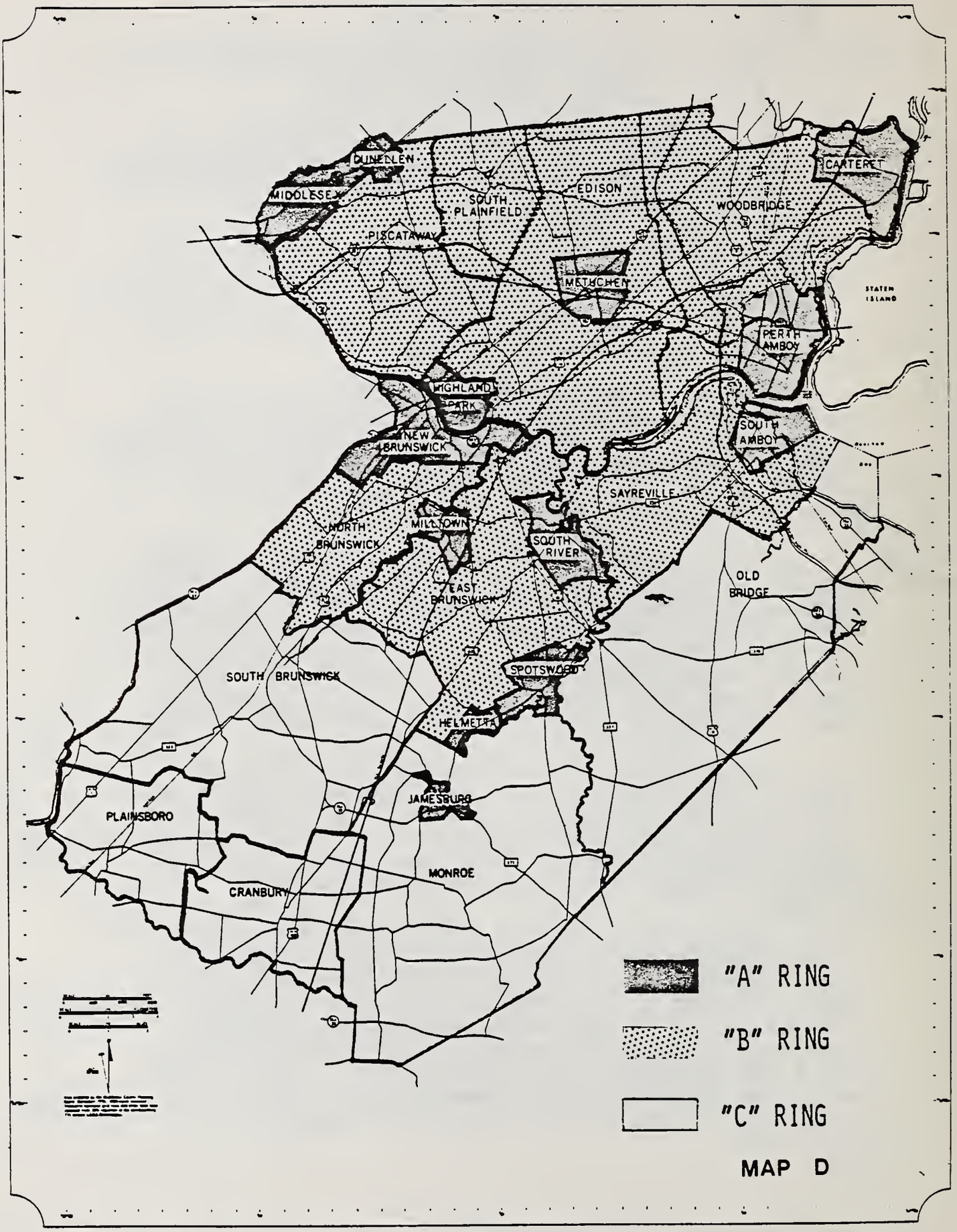

DUNELLEN
MIDDLESEX
SOUTH PLAINFIELD
EDISON
WOODBRIDGE
CARTERET
PISCATAWAY
METUCHEN
STATEN ISLAND
PERTH AMBOY
HIGHLAND PARK
NEW BRUNSWICK
SOUTH AMBOY
SAYREVILLE
NORTH BRUNSWICK
MILLTOWN
SOUTH RIVER
OLD BRIDGE
EAST BRUNSWICK
SPOTSWOOD
SOUTH BRUNSWICK
HELMETTA
JAMESBURG
PLAINSBORO
MONROE
CRANBURY
"A" RING
"B" RING
"C" RING
MAP D

TABLE I-A

Middlesex County Land Use Chart (1974)% of Acres

AREA

Type	"A" Ring	"B" Ring	"C" Ring	County-Wide
Commercial	8.7	6.7	1.6	4.6
Industrial Light	6.8	6.1	0.9	3.8
Industrial Heavy	7.1	4.0	1.4	3.5
Vacant Land	16.8	35.2	44.3	37.4
Farm Land	0.5	4.2	31.2	16.3
Residential	42.4	30.6	8.9	21.9
Water/Swamp	8.4	3.1	2.2	3.3
Park	7.6	7.4	5.1	8.0

SOURCE: Middlesex County Planning Board, "General Statistica for Middlesex County, " 1978.

The "A" Ring Comprises: Carteret, Dunellen, Helmetta, Highland Park, Jamesburg, Metuchen, Middlesex, Milltown, New Brunswick, Perth Amboy, South Amboy, South River, Spotswood.

The "B" Ring Comprises: East Brunswick, Edison, North Brunswick, Piscataway, Sayreville, South Plainfield, Woodbridge.

The "C" Ring Comprises: Cranbury, Old Bridge, Monroe, Plainsboro, South Brunswick.

B. Demographics and Transportation Statistics

Middlesex County encompasses 319 square miles in area and is comprised of 25 incorporated towns and cities. The population as of 1970 was 583,813* which established a density of 1,869 people per square mile of land. The per capita income at the beginning of this decade was approximately $3,159 for the County, while employment in Middlesex was at 239,940 with auto registration showing car ownership at 260,866 vehicles.

Commuter statistics for 1970 show that 228,000 work trips were made daily by County residents with the following breakdown:

-Daily internal trips within the County:	67%
-Commute to neighboring counties of Monmouth, Somerset, Mercer and Union:	18%
-Commute to North Jersey:	9%
-Commute to New York:	6%

There were an additional 48,000 daily commuting trips made by residents of other counties to work in the County.

Important to note is the fact that the internal trips made were characterized by overwhelming auto use. More than 83% of all internal trips were made by this mode of travel. Contrastingly, over 77% of all New York City-bound trips were made by mass transit. This imbalance towards auto use has put a great burden on the County's road system. This coupled with the anticipated diminishing levels of federal spending for transportation improvements and ever increasing demand on the system has led to the deteriorating conditions found on the transportation system today (See section C: Roadway System).

Ever increasing demand is foretold by the fast-paced growth which has occured recently in the County.

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* These statistics and those following were taken from two main sources: "Middlesex County on the Move" - 1976 Annual Transportation Report and "General Statistics for Middlesex County"- April 1978-both prepared by the Middlesex County Planning Board.

Between 1970 and 1975, the population and population density increased by about 5% to 612,464 and 1,961 persons/square mile, respectively. The per capita income more than doubled to $6,699. Auto registration increased by 13.2% to 295,218 while employment went up 7.4% to 257,597. This resulted in further growth in traffic volumes, vehicles on the roads and, especially in additional work trips during the peak periods. Therefore, physical deterioration of the roadways has continued to worsen.

C. Roadway System

Middlesex County's central location has led to rapid growth and development through the 1950's and 1960's which has continued into the present decade. The County, as the gateway to the New York Metropolitan area and the regional link to South Jersey and Philadelphia, also experienced rapid roadway development in the 50's and 60's. This, together with the County's location, has resulted in significant levels of regional travel demand on the system. The early growth of the County and its roadway network was for the most part random and unchecked as a result of very little central planning and comprehensive analysis. As noted earlier, the County has a substantial and growing population. As also noted, there has been a good deal of industrial and commercial development in Middlesex County. Together, this has generated a high volume of intra-county traffic movements. Interaction of this local traffic with the obvious regional importance of the County's roadway network has created a precarious situation of traffic movement conflicts at key intersections of commuter routes.

Middlesex serves as the crossroads for several major freeways and highways which pass through the area. These facilities were originally designed to accomodate substantially less traffic than is presently being handled. These large increases in non-local traffic have resulted in extensive modifications to the major inter-regional facilities such as New Jersey Turnpike and the Garden State Parkway. These major roadways in combination with other principal arterials, minor arterials and collector roadways are intended to carry the majority of all commuter traffic for regional and intra-county travel. The reality of the situation has proven to be quite different, however, due to a variety of transportation problems and network deficiencies.

The functionally classified roadways discussed earlier make up less than 30% of the County's entire roadway network. The vast majority, over 70% of the network mileage, is comprised of "local" roads. The capacity problems inherent in this roadway system stem from the fact that Middlesex County's highway system is predominantly two lanes, with approximately 75% of the mileage falling within this category.[1] Less than 10% of the total mileage has more than four traffic lanes with nearly all of this mileage at the freeway and expressway level.[2] The arterial system, which is mostly made up of County roads, has a major deficiency with approximately 77% of the system's mileage having only two lanes. This is well below the recommended standard of 4 to 6 lanes for arterials. These deficiencies are further reflected by low overall average network speeds. [3]

Analysis of the physical characteristics of the existing highway network was undertaken by Alan M. Voorhees and Associatees in 1969 for the Middlesex County Master Plan published in the section called, "Highway Inventory And Analysis". This analysis revealed substandard conditions in quality of service and geometric design. Little major improvment has been implemented since then to correct the situation.

The County's transportation problems contribute to and are affected by the condition of the highway network. There is a strong corralation between land use, regional demand and highway conditions. Heavy development along major corridors constricts rights of way less than the National Commission on Urban Transportation's recommended range of 60-80 feet.[4] In addition, 95% of the arterial network mileage is substandard with the majority of this mileage characterized by rights-of-way of 50-60 feet.[5] Only the freeway and expressway roadways meet standard right of way requirements while representing a very small percentage of the entire highway network. Such constrictions create low carrying capacity for the entire network. Demand on the roadway network, however, remains high. (As noted in Table I-B).[6]

TABLE I-B

Average Annual Daily Traffic
Selected Locations, Middlesex County

ROUTE	MUNICIPALITY	AADT 1977
N.J. Turnpike	South Brunswick	64.2
N.J. Turnpike	Woodbridge	116.9
Garden State Parkway	Woodbridge	65.2
Route 1	North Brunswick	70.1
Route 1	New Brunswick	70.3
Route 1	Edison	66.8
Route 440	Edison	64.3
Route 27	Highland Park	20.8
Route 287	Piscataway	65.5
Route 514	Edison	28.0
Route 35	Perth Amboy	17.8
Route 35	Woodbridge	17.5

Source: NJDOT 1977 AADT maps

Travel density is a good indicator of the extent to which demand exceeds supply. Vehicle miles travelled per mile of roadway indicate the intensity of demand for road space. Travel density is affected by the density of population, employment and non-residential land uses. As these factors increase in intensity a corresponding increase in travel density can be expected. This description adequately depicts the situation which has existed in Middlesex County over the past few decades. As the County became more and more developed it became an area of more heavily concentrated travel.

According to statistics developed by the Tri-State Regional Commission, Middlesex County experiences the highest rate of traffic volume per lane of roadway for any subregion in the New York SMSA.[7] Due to constricted rights-of-way, this high demand creates problems of capacity deficiency throughout the network. Many of the major arterials and collectors change in capacity from one link to the next, often reflecting the design of the roadway and the development characteristics of the area. These inconsistencies cause a great deal of problems especially, traffic delay and congestion. The overall capacity deficiency of the network, however, is due in a large part to the regional service of the Middlesex County travel corridor. This places an undue burden on the entire system, which also has to carry the already high volume of intra-county traffic.

All of the previously discussed problems combined with various jurisdictional problems of highway systems management have contributed to an extremely deteriorated condition of the system. This poor physical condition decreases capacity even further, increasing delays and congestion. The multiplicity of jurisdictional responsibility for highway management and maintenance, with varying and sometimes conflicting standards, is partially to blame for the condition of the highway network. Too often, decisions at one level of government have adverse repercussions throughout the system. Proper transition from one level of roadway to another is often ignored. Further, roadway maintenance has gone undone due to jurisdictional disputes. Traffic conflicts and problems in one area may back up traffic throughout an entire sub-region. In other words, breakdowns in service due to inconsistent design and the poor physical condition of existing facilities coupled with ever increasing demand on major roadways have had a spillover effect, impacting the local system causing delays and congestion throughout the surrounding community.

Much of the preceeding description of Middlesex County's Highway Network and its problems was derived from a County Planning Board Publication, Highway, Inventory and Analysis first published in 1969. This publication served as the basis for the TOPICS Study conducted at that time. The description is still accurate today, as was mentioned, because few major changes, if any, have occured since that time. While the TOPICS Study was limited in scope and unable to stem the tide of evermounting transportation problems, many of the findings are still valid and applicable. The Study, however, dealt only with traffic engineering improvements and ignored two important areas which deal with the carrying capacity of the transportation system and congestion: mass transit and demand management. The following section describes the mass transit system in Middlesex County and ongoing demand management activities.

D. PUBLIC TRANSPORTATION NETWORK

Historically, Middlesex County has played an important role in the development of public transportation in New Jersey and the County. From colonial days to the present, public transportation innovations have taken place in Middlesex County. The Delaware and Raritan Canal had its terminal in New Brunswick. This canal is still intact and has been preserved as a linear park. One of the nation's very first operating railroads, the Camden and Amboy Railroad, also ran through the County.

Today, transit in New Jersey remains in the hands of private operators. Governmental involvement (State and County) has been limited for the most part to providing operating assistance to these carriers (although in one County, Morris, transit is operated by a public agency). However, some counties including Middlesex, have also become involved in providing technical and marketing assistance to the bus companies.

It should be noted, however, that all bus companies do not receive an operating subsidy. Although three-fourths of New Jersey's bus passengers are carried on subsidized carriers, one-quarter are carried on profit-making carriers. Two carriers in the County are profit making and carry about one-third of the County's bus passengers. The companies in the State which remain profitable, for the most part, operate long haul suburban routes to New York or local service in the extreme high density areas of Northern New Jersey.

The State has also been involved in major bus purchases to modernize New Jersey's bus fleet. These buses are owned by the State and leased to the carriers for $1 a year. The buses are available to both subsidized and non-subsidized carriers.

The public transit system which operates in Middlesex County can be characterized as having two disparate parts. The first part consists of the commuter network which is composed of the long haul bus and rail operations to Newark and New York City. The second part consists of those primarily local bus lines which provide intra-County service. Each part has its own unique attributes and ridership characteristics.

The public transit commuter network is composed of three rail lines and approximately ten bus lines. All of the rail lines serve Newark and New York, while eight bus lines serve New York and two bus lines (with infrequent service) go to Newark. Most of the ridership is work-oriented and therefore, concentrated in the peak periods. Service is provided every fifteen minutes in the peak and at a minimum of every hour in the off peak. Ridership on the lines, for the most part, continues to grow.

The local network is characterized by routes which have been operating on the same streets since World War II. As a result, patronage on these routes has been declining over the years. As demand shifted elsewhere, these routes have not been altered. This has resulted in some revenue losses. The response by the bus companies in the past has been to cut back, and in some cases terminate service. Until recently, this trend has continued unchecked.

In the past two years, the County has become involved in improving the local bus network. By providing technical assistance in the areas of route planning, scheduling and marketing, the County has been able to reverse the trend. Through their efforts, for example, increases in ridership on one line of 150% have been achieved.

Provided in the appendix are listings, sample fares, and sample service frequencies for those services in the TSM study corridors.

The County of Middlesex has only recently begun activities in the area of demand management. The County had taken a "hands-off" attitude towards the private sector. As the County grew substantially over the past few decades, this posture resulted in a larger traffic demand on the system than was possible to manage through increased capacity alone. The County now offers assistance to any private industry or institution interested in demand management techniques such as car and vanpooling, staggering work hours and the like. To date there has been only minor response in this area. However, there does exist two very successful private vanpool programs within the County. These involve companies that recently move their entire operation into the County and thus felt a need to supply a "reasonable" means of transport to their employees.

CHAPTER 2:

PRIOR EFFORTS IN TSM AND INITIATION OF THE PROTOTYPE STUDY

In order to further understand the setting in which this study has been undertaken, especially with respect to institutional issues, the following discussion of earlier work in Middlesex County on TSM is provided.

A. Initial Response

When first issued in 1975, the TSM requirements were initially regarded as a vague set of federal regulations. It was quite difficult to understand the impact these regulations would have on transportation projects currently under consideration in the County. This led to a cautious approach in undertaking initial TSM activities.

The first TSM element of the County Transportation Improvement Program (TIP) was completed in a very short time frame. This was required in order that the Middlesex County subregion's input to the Tri-State Regional Planning Commission's regional report could be prepared on a timely basis. As a result, County staff was not able to adequately and fully analyze the TSM regulations. It can thus be said that the first TSM report did not reflect what would ultimately be Middlesex County's understanding of and response to TSM.

Analysis of a set of TSM documents indicated that this first TSM report was prepared in a manner similar to that undertaken by many other areas throughout the country. The County's Transportation Improvement Program (TIP) project listing was reviewed and those projects which fit the TSM description in the regulation were selected. These included TOPICS improvements, channelization improvements, new signals, etc... Also listed were those demand related strategies which had been identified in various plans and reports. These included car/vanpooling projects, transit routing changes and staggered work hour demonstrations. All of these were distilled into the first TSM report.

After the TSM document was developed by the staff, it was submitted to the County Transportation Coordinating Committee and Middlesex County Planning Board for endorsement. It was then submitted to the Tri-State Regional Planning Commission. Tri-State assimilated each document prepared by various subregional agencies into the region-wide TSM plan.

B. Prototype Study Funding

Once the first TSM report was prepared, adequate time was available to further review the TSM regulations. This review revealed that TSM had a real potential for providing relief for many transportation problems. At the same time, the County was becoming more and more involved in project implementation. Various institutional problems which hinder the implementation process also became clear through this involvement in project implementation. It was at this point that TSM appeared to be a vehicle for achieving some of the much needed relief on the transportation system. Furthermore, TSM was geared, in theory, to bring the relief in a short time and make more efficient use of available financial resources.

This new understanding of TSM led to a desire for a more comprehensive assessment of TSM for the County. This was discussed with the County's Transportation Coordinating Committee. This resulted in the request that staff assign a priority to finding a means of undertaking a comprehensive TSM study. Initially explored was the possibility of reassigning staff to work on TSM. This, however, proved to be infeasible due to present work loads. The alternatives which remained included addition of staff, use of a consultant, or a combination of both.

Coinciding with this search for a means for undertaking a TSM study, UMTA announced its plans to give TSM prototype study funds to areas throughout the Country. A proposal for funding under this program was then developed and discussed with the Planning Board and Transportation Coordinating Committee. This resulted in an agreement to pursue funding to conduct the study.

The County next approached the Tri-State Regional Planning Commission to seek their assistance in securing funding from UMTA. A program outline, based on the proposal was thus developed and submitted to Tri-State for their use in pursuing this funding. Received in this funding allowed the one-year study reported on in this document to begin shortly thereafter.

C. Study Initiation

Some key influencing factors in deciding to pursue funding for a study were the planning mechanisms already in place in the County. Middlesex County already had an active Transportation Coordinating Committee (TCC)[1] and public participation program. In addition, the Middlesex County Planning Board transportation staff and the Middlesex County Engineer's Office were involved in improving the flow of State and federal funds for transportation projects and were searching for methods to streamline this process.

The traditional County method for success in any study has always been to have solid input from the public. The TCC was already in place and provided a vehicle for this public input. The TCC represented a ready source of people, ideas, and opinions for moving a TSM study forward. In addition, the County also publishes a transportation newsletter and has maintained an excellent relationship with the local media. It was felt that these would aid in the flow of information to the general public and would allow for greater feedback to the planning process.

Although a public participation mechanism is important, it is equally important that a well informed staff work on a project. In the County, the Planning Board transportation staff and County Engineer's staff both were anxious to commence work on the study. Both staffs were aware of the problems of implementing transportation projects with State and federal funds in New Jersey and they had been looking to improve the process. In addition, there was a recognized need to relieve the congestion on the County's transportation network in a more effective manner. The agreement of the two staffs to cooperate in this study exhibited their commitment to making it a success. This agreement, together with the TCC endorcement of the project, created the necessary climate in which to commence the prototype study.

CHAPTER 3: RATIONALE FOR THE STUDY

In the previous chapter, the County's initial approach to TSM and the history of the efforts leading up to the awarding of the UMTA grant were discussed. In this chapter the results expected from the prototype TSM study, and the unique nature of it are discussed.

SECTION - 1

A. Overall Study Goals And Expected Results

An important result expected from this project was a test of the applicability of TSM to Middlesex County and its institutional and technical structure. It was felt that TSM-type improvements might address the County's traffic problems quickly and inexpensively. However, it would be necessary to assess the feasibility of TSM in the area to further understand its realistic potential. The basic approach to be taken involved the identification of transportation problems followed by a determination of the kinds of TSM improvements which would provide realistic solutions to these problems under the constraints of a "real-life" situation. The project presented an opportunity to accomplish this task thoroughly and efficiently.

Secondly, another important expected result involved an assessment of how the TSM regulations could apply in areas similar to Middlesex County. The County, as a result of the study, would be able to explore and suggest further guidance which would make these regulations most effective in areas like Middlesex County.

SECTION - 2

B. Study Objectives

In attempting to insure that these results would be attained, a set of three objectives was developed for the study.

The first objective was to develop a TSM implementation plan which identifies those strategies which would result in improved transportation efficiency in the County. Packages of various supportive strategies would be identified along specified travel corridors to accomplsih this. The plan would also outline an implementation time frame and identify possible funding sources.

The next objective was to improve or suggest methods of improving the institutional relationships which affect transportation project implementation process. There was a perceived need to pinpoint exactly where delays for implementing projects were to be founded to determine the best means for removing these delays. The primary purpose was to shorten the project implementation time in any way possible.

The last objective was to suggest further guidance in TSM which could improve its applicability in Middlesex County and elsewhere.

SECTION - 3

C. Unique Study Features

In establishing the parameters in which the study was to be conducted, Middlesex County developed an approach which was unique,compared to the other prototype studies funded by UMTA as a part of this overall program.

As noted earlier, a key feature of this study was the attempt to test the TSM concept by identifying those TSM type projects or strategies which would have applicability in Middlesex County. The study was thus designed to identify all those TSM strategies which would provide realistic solutions to Middlesex County's transportation problems. This broad based approach allowed for a comprehensive analysis of the potential impacts from the range of TSM actions recommended in the Federal regulations.

The second unique aspect of this study involved the examination of strategies along an entire travel corridor. It was felt that assessing TSM improvements in segregated situations would not provide a complete investigation of a comprehensive TSM process. Application of TSM strategies at isolated locations along a travel corridor has the potential of merely shifting a problem to another site along the corridor. Thus, entire travel corridors were assessed in order to determine the impact TSM strategies would have throughout the entire sub area. This enabled a broader test of TSM improvements as part of unified improvement program for eventual widespread application.

One of the major problems in achieving expeditious implementation of transportation projects in New Jersey is the lengthy process necessary to obtain funding. This would be a major hinderance to instituting a TSM program which is predicated on quick implementation. Thus, an in-depth review of the institutional relationships and procedures which affect

project implementation was planned as part of the study. The funding process review represented the first attempt of this kind of analysis in New Jersey, which also made this effort the only prototype study to place an emphasis on the effects that implementation procedures can have on the TSM process.

It was the intended purpose of the study then, to attempt to examine all factors which could have an impact on TSM's applicability in Middlesex County and areas similar to it. As a result, the approach taken was as broad in scope as possible for investigating TSM within the constraints governing the study.

CHAPTER 4: STUDY DESIGN AND OPERATION

A. Work Tasks

As noted previously, Middlesex County has been growing rapidly in recent years. Forecasts indicate that the trend will continue. It has been the concern of all those involved in the County's transportation program that development within the County not be adversely effected by an inadequate transportation system.

As has also been noted (See Chapter 1-Roadway System and Transit) the existing roadway and transit systems within the County are presently operating at an inefficient level of service. Numerous problems or deficiencies have been identified within these systems which have thus far gone uncorrected in the normal course of the transportation policy-making and project implementation process. Project cost and/or the overly lengthy time period for implementation of improvements has contributed to this deterioration of the systems.

The present condition of the County's Transportation Systems and the procedural inefficiencies of the existing funding process led to the development of certain study objectives. These included the provision of an institutional framework within which the County could facilitate working relationships among all parties involved in transportation policy-making, project implementation and systems operation and the identification of feasible TSM planning methods and strategies for Middlesex County. In order to address the objectives, the following process was developed. Institutionally, the County of Middlesex, as the study sponsor, designated the County Planning Board as the project coordinating staff, working with the County Engineer's Office to carry out the Project Work Program. These offices were to act as TSM technical staff working under the guidance of a TSM Project Steering Committee.

Appointed at the outset of the study, this Steering Committee included representatives of both the Planning Board and Engineer's Office along with representatives of the Middlesex County Transportation Coordinating Committee, New Jersey Department of Transportation, Tri-State Regional Planning Commission and local transit operators. The Committee was established, inpart, to improve the working relationship among those bodies represented.

The TSM Staff carried out all work program tasks, presenting all data and findings to the Committee for approval. The Committee was then available for policy and review of the technical analysis completed by staff. This relationship worked well with the technical expertise of the staff providing the Committee members the necessary resources to deal with the complex set of problems encountered. The varied backgrounds of the Committee members provided the staff a good sounding board upon which to gauge local and institutional positions on the directions being taken during the course of the study.

The technical work program was divided into eight major tasks. The TSM staff carried out the work program as outlined below, following its general intent and direction with some of the tasks running concurrently. The discussion below highlights the tasks proposed and some of the work accomplished in each. Subsequent chapters provide further detail on key tasks.

TaskI-Specify Objectives & List TSM Strategies:

The TSM staff developed a package describing TSM in terms of existing federal guidelines and other current publications, showing examples of the general types of improvements along with the objectives they were aiming to achieve. The general object areas were to :

A. Improve the Efficiency of the Existing Highway Systems
B. Promote Public Transit Usage
C. Improve the Quality of the Environment

The staff also investigated the level of TSM-type improvements already accomplished in the County. After careful consideration of the presented material and upon recommendations from the staff, the Committee adopted the following list of more detailed objectives and measures to be addressed in the study:

A. Improve Efficiency of the Existing Highway System

-decrease peak hour congestion
-reduce travel time
-reduce energy consumption
-reduce number of accidents
-increase use of High Occupancy Vehicles (HOV's)

B. Promote Public Transit Usage

-improve transit services to better reflect the needs of the community
-use of public relations to create a favorable attitude towards mass transit and disseminate information to reduce passenger confusion
-reduce auto-use in corridor
-improve modal interface
-improve and increase accessibility to CBD for entire community
-reduce peak-hour demand, where necessary

C. Improve Quality of the Environment

-reduce vehicular noise and pollutant emissions
-reduce number of vehicles used in corridor
-relieve congestion
-reduce flooding on roadways

Task II-Select High Priority Problem Areas And Corridors:

The staff researched the entire County transportation system and cataloged a number of travel corridors and urban areas which exhibited numerous transportation problems. These areas were categorized into three groupings.

A. Major Corridors-those travel corridors which pass north to south or east to west through the entire County.

B. Minor Corridors-those travel corridors which serve major traffic movements but do not pass through the entire County. These generally pass through 3 or 4 towns and are 5 to 10 miles in length.

C. Towns or Communities-these are locations within the County which have major travel movement problems. They are generally the older sections of the County which were developed prior to 1960.

The following corridors were selected by the staff as recommended study areas in the listed categories, due to the multiplicity of problems existing along them and their importance to the overall county transportation system.

(See Map B)

A. Major Corridors

-U.S. Route 9
-U.S. Route 1/N.J. Route 27
-N.J. Route 18

B. Minor Corridors

-Plainfield Avenue
-Oak Tree Road
-Wood Avenue
-Roosevelt Avenue
-Parsonage Road
-Milltown Road
-New Brunswick Avenue
-Route 522
-Cranbury/Plainsboro Road
-Landing Land/River Road/Metlars Lane
-How Lane/Jersey Avenue/Livingston Avenue

C. Urban Areas

-New Brunswick
-Carteret
-Perth Amboy
-Woodbridge
-South River
-Highland Park

A profile of the characteristics of each area and the types of problems encountered in it was prepared by the staff and presented to the Committee as background for the selection of the study areas. The Major and Minor Corridors chosen by the Committee are as follows:

a). The major area selected was the U.S. Route 1/N.J. Route 27 corridor. This corridor received 60% of the votes of the Steering Committee. Reasons expressed for this choice included:

1. Encompasses a variety of land use types: suburban, urban and rural; residential, commercial, industrial, office/research.

2. Traverses all subregions of the County.

3. Possesses all modes of transportation, including rail.

4. Holds greater potential for the application many TSM strategies.

b). The minor corridor selected was Milltown Road. This corridor received approximately 54% of the votes cast by the several reasons among which were the following:

1. Has a restricted right-of-way due to the highly developed nature of the area and thus precludes extensive widening of the roadway.

2. The varied land use involving mainly older residential communities of the County with high densities. Improvements will effect a large number of people.

3. Existence of mass transit, with falling ridership, despite the high density of population.

The Committee also decided to expand its membership to include better representation of those areas to be studied which are not presently on the Committee. Once a set of study corridors was chosen, the identification of specific problems and problem areas was handled in a more intricate manner. It was decided by the Committee that the staff should gain additional input in problem identification. For this purpose it was felt that those best qualified to identify problem areas are those who face them daily, the systems users and operators.

The staff identified, therefore, transit operators with lines along the corridors, businesses and industries most directly affected by travel on the corridor, and all communities through which the corridors passed. Problem identification sheets were developed (See Appendix) and distributed in a variety of ways (See Citizen Participation Section). Technical staff at the State and County were also contacted for input, as well as, citizen representatives on the County TCC.

The feedback from all of these varied sources resulted in the compilation of a very extensive list of identified problems and problem areas. These lists were categorized by the staff according to location, frequency of identification and feasibility of correction.

This task began to shape the TSM planning process to Middlesex County's needs and problems. Cooridors were chosen as the framework for investigating TSM strategies in consideration of the through trip character of the traffic volumes and in light of the variety of institutions and related transportation modes that must be considered.

The Committee and Staff agreed at the onset of the study that a significant amount of public input was necessary if the TSM Prototype Planning Study was to be successful. Thus, a variety of strategies to bring the public into the planning and policy-making process of this study were developed. The project objective was to develop better working relationships between various actors in the transportation improvement process and developing better mechanisms for project implementation.

Tasks III-Develop Or Refine Specific TSM Proposals:

Concurrently with the work being undertaken on problem identification, the staff also investigated all implemented and planned TSM-type improvements for the County. The staff also requested of the same people who identified the problem areas that they suggest some feasible alternative solutions to these problems. As a result of this work the staff was able to compile an all-inclusive list of possible improvements for the identified problem areas.

The next step in this process was to weed out non-TSM-type strategies, unfeasible and impractical improvements. The remaining list of strategies was categorized by location, cost and probable time of implementation.

At this point the County, obtained consultant assistance to analyze the final list of candidate strategies to determine the impact of the proposed actions. This effort was much more difficult then originally envisioned, mainly due to deficiencies in the amount of existing data available about the problem areas and overall transportation systems.

The staff and the Steering Committee worked closely with the consultant. The Committee had direct input into the evaluation of the consultant's analysis and the preparation of a final list of recommended strategies for each corridor. This list was presented to the public for comment at an open meeting of the Steering Committee as well as various other public functions (See Citizen Participation Section in this Chapter).

The staff recorded all of the public input. It was from this input along with Steering Committee comments and the consultants' report that the staff developed the finalized list of TSM Strategies for implementation.

The TSM Prototype Study began to show tangible rewards for the effort with the completion of this task. The design of this part of the study was especially productive for testing the conecpt and achieving the study goals. Maximum input possible was obtained, thereby assuring concurrence on the final product. Insight was also gained on the value of having all parties concerned with a given transportation problem involved early in the planning process by allowing discussions of both the problem and possible solutions. In this manner there can be achieved some measure of agreement on alternative improvement strategies.

This task provided a list of the TSM-types of improvements that appear to be applicable to the current problems in Middlesex County and a planning method to help insure their application.

Chapters 5 and 6 provide more detail on the results of this task.

Task IV-Develop An Implementation Plan:

An integral part of the consultant report was a draft implementation plan. This plan prioritized the recommended strategies by time and cost of implementation. The staff then assessed these projects over a three to four year time period with the easily implementable, relatively low cost improvements coming in the first two years and the more difficult ones coming later.

The consultant effort also helped to identify funding sources to be explored, any legal ramifications that might have to be overcome before implementation, application procedures, and some other aspects of the implementation process.

The staff and Steering Committee reviewed the consultants' report and used it as a resource document in developing the final implementation plan.

Chapters 7 and 8 discuss this task and its results in greater detail.

Task V-Develop Guidelines For Monitoring Implemented Projects:

As a by-product of analyzing the recommended strategies and identified problem areas, the staff became aware of the data needed for more effective TSM planning and existing deficiencies in available data. Task V was originally designed to undertake the development of the TSM monitoring guidelines. The deficiencies in available data made this aspect using some of the consultants' recommendations and under the guidance of the Steering Committee, developed guidelines for monitoring the changes in the system resulting from TSM implementation. These guidelines include data requirements, alternative methods of data collection, recommended systems' monitoring techniques and measures of effectiveness.

This task is described in greater detail in Chapter 9.

Task VI-Guidelines For Applying TSM Strategies To Similar Areas:

Project staff undertook the development of guidelines for the application of TSM Strategies in areas similar to Middlesex County. These guidelines are designed to be useful in the evaluation of existing problems, the development of related, feasible TSM strategies and the implementation of these strategies. These guidelines are designed to be generally applicable to any part of the Country with similar transportation systems characteristics.

This task concluded the effort. By describing the process undertaken, the successes achieved and the problems incountered, it is hoped that other areas can easily apply a similar technique in undertaking an effective, comprehensive approach to TSM. The guidelines developed are designed to allow transportation planners to initiate a similar program, as a part of an area planning process. This should facilitate the implementation of transportation improvements and realize a more efficient systems approach.

Discussion in greater detail of these results and findings is contained in Chapter 10.

Task VII-Briefing On Results & Task VIII-Final Report

Just prior to the development of the final report the staff provided briefing to the project sponsors---Tri-State and UMTA--- covering the results of Task I through VI. These briefings were intended as a preliminary review of project findings prior to publication.

After the completion of these briefings, the Staff developed the Prototype Study final report. This was presented to the public for comment and reviewed by the Steering Committee for delibertation prior to final acceptance and submission to Tri-State and UMTA.

These two tasks tie in the entire effort to its original intent: to report on the comprehensive approach to TSM planning taken and to assess the feasibility of this approach as a viable planning and implementation methodolgy for improving existing transportation systems.

B. Role Of Public Participation

Early in development of the study it was concluded that local input would be necessary from the outset in both data collection and project implementation in order for the prototype study to be successful. The Study's Work Program reflected this goal in its design.

The organization and utilization of a TSM Steering Committee was an important element of the public participation effort designed into the study. As noted, the Committee was established to oversee the work program. To represent localities, several TCC members from various parts of the County were appointed to this committee. Transportation planning participants included persons on the local, County, State, and regional levels. In addition, local transit operators were represented on the Committee . This body was instrumental in managing the direction of the study and was called upon to make decisions regarding the study's outcome.

One very important decision in the area of public input was made by the Committee early in the development of the study--- that the TSM staff contact local business and industry along the study corridors for input into transportation problem identification and concurrence on strategy alternatives. This was accomplished by meeting with representatives of these establishments at various Chamber of Commerce meetings. The staff under Steering Committee direction, attempted to contact and work closely with officials of the Chambers of Commerce coinciding with specific areas along the corridors. A set of public meetings was also arranged (See appendix for detailed chronology of all public meetings).

Involvement of the Chamber of Commerce was obtained early in the study process and was very profitable for the study. TSM staff attended several luncheon meetings of the different Chambers and presented to the membership the details of the study and the concepts behind it. The staff was able to interact very well with Chamber representatives under the relaxed conditions at the luncheons, answering questions about TSM and further explaining the concepts.

The main purpose of these meetings was to get the chamber members' ideas on problems with the existing transportation system and their suggested solutions. This also afforded a good opportunity to test the reaction to various strategy alternatives from a segment of the public sector whose cooperation was vital to implement demand management strategies.

These meetings were tremendously beneficial for the study. The TSM concept of relatively low cost and quickly implementable solutions to transportation problems was well received. There was a spirit of cooperation and a willingness to get involved on the part of the chamber members, who were very receptive to all strategy alternatives discussed. As a matter of fact, several representatives recommended the use of demand management strategies such as staggering working hours, van and carpooling and the like to reduce congestion in the study areas.

The input from these chamber meetings was very valuable to the staff in identifying transportation problems and possible soultions. The staff sought similar input, although with a somewhat lesser degree of success, from the Middlesex County Transportation Coordinating Committee as a body representing localities throughout the County, as well as transit operators county-wide. Very useful input was received from technical staff at the local, County and State levels during the course of the study.

Once a candidate list of TSM Strategies for further analysis was adopted, further public involvement was sought. The list of candidate strategies was submitted to all the groups contacted earlier for review and comment. All parties concerned, the chamber groups, the TCC, the technical staffs and an added group of mayors representing the towns along the Minor Corridor accepted the list of strategies, some with minor reservations which were noted by the staff for further analysis.

Prior to the completion of the consultant's final report on the strategy impacts, the Steering Committee held an open public meeting to obtain additional public input and comment on the candidate strategies. The intent behind the public meeting was to better acquaint the general public with the work carried out to that point, to get feedback which might aid in implementation of the projects, and to address potential points of controversy. The Steering Committee used the results of this public meeting to assist in the selection of final strategies recommended in the consultant and staff reports on strategy analysis.

The entire TSM Study had excellent news coverage throughout the course of the year. Additionally, progress reports were given at all public TCC meetings and several County Planning Board meetings to obtain greater public exposure of study results. The County Board of Chosen Freeholders and the County Planning Board members were also given final reports for review prior to public distribution.

C. Intergovernmental Relations

The Transportation System consists of many parts, each within the jurisdiction and control of separate governmental units. System demand is also generated from varied sources within these jurisdictions. Further, funding for system improvements and the decision process for allocations must flow through many levels of government.

An examination of intergovernmental relations and their effects upon transportation policy-making and project implementation is extremely valuable for any systems improvement plan. It is only through this examination that the efficiencies and deficiencies in the transportation improvement process can be determined and recommendations developed to help expedite the entire process of policy-making and project implementation.

The idea of bettering intergovernmental relations was an intergral element of Middlesex County's TSM Prototype Study from its inception. The TSM Steering Committee represents the actors on all levels of interaction within the transportation policy-making and project implementation process. The work program, as has been seen, is geared towards implementing projects quickly with sufficient input from all concerned parties. The County found this aspect of the study to be so important to TSM that it was decided to expand the effort to include a complete analysis of intergovernmental relationships in the transportation planning process in Middlesex.

The study of intergovernmental relations was focused on the special situation existing in New Jersey, but can easily be applied elsewhere. It describes the unique characteristics of New Jersey as a "home rule" state, where the parochial interests of small autunomous towns and cities often conflict with those of higher levels of government.

The study gave a good overview of all actors involved in transportation policy-making and project implementation on the local, County, State, regional and federal levels. Their roles in the process and how they interact were assessed. Also examined were the functions of all involved agencies, departments and the like as well as any relevant legislation which must be followed.

The relationships between the actors were analyzed by outlining in detail the transportation improvement process for capital-intensive roadway and transit projects. Also discussed were non-capital-intensive TSM combinations of projects regarding these inter-relations.

Determinations were then made as to which of these relationships enhance or hinder the TSM objectives. These objectives succinctly stated are:

> "to develop comprehensive packages of quickly implementable transportation improvement strategies, which when implemented will aid in the management of the entire transportation system to meet present and future needs of the community."

These relationships and procedures were analyzed specifically for Middlesex County, while also being expanded for application nationwide.

In addition to the legislative, procedural and case study research that was conducted by the staff, a questionnaire was used to gain additional insight into the transportation improvement process. This questionnaire was distributed to professional planners, engineers and public representatives on all levels of government in order to sample opinions concerning various elements of the process and the resulting intergovernmental relationships in Middlesex County.

Finally, a comprehensive set of recommendations were developed and categorized into two groups:

(a) Those primarily affecting decision-making
(b) Those primarily relating to project implementation

The recommendations were also specifically directed towards the level of government that would be impacted. A general application of the recommendation to areas similar to Middlesex was also outlined in this section of the report. In all instances specific attention was given to those recommendations which directly relate to improving conditions for maximum development of TSM-type combinations of projects.

CHAPTER 5: SELECTION OF STRATEGIES

A. Selection Process

This chapter describes the way in which TSM strategies were selected and analyzed. It essentially represents further detail on Task II, as described earlier. As noted, public input was an important aspect of the study. The identification of problem areas along the corridors was one specific task where it was felt that public input would be very useful. It was the opinion of the Steering Committee and technical staff that those who use the system daily would best be able to identify its problems and suggest some helpful recommendations for possible solutions. Thus, the Committee recommended that, since business and industry are heavy traffic generators along the corridors, these firms be contacted. This was accomplished through the Chambers of Commerce of which these firms were members.

The Steering Committee formally adopted this as a course of action and directed the staff to identify those firms which would be found in the study corridors and the corresponding Chambers of Commerce. The staff examined the corridors and identified firms located along or adjacent to the facilities in the corridors. Also identified were areas of concentrated industrial or commercial activity. By reviewing chamber directories, County publications and State employment figures, the staff was able to develop the list of industries, business firms, retail developments, industrial parks, hospitals, other institutional establishments affecting specific subareas of the corridors. Members of the Steering Committee who were also members arranged for contact between the staff and the proper Chambers of Commerce for each particular subarea.

The Woodbridge Chamber of Commerce was contacted for the northern sector of the County (subarea "A"). For the area just south of that sector (subarea "B"), the Edison Chamber of Commerce was called. The central region of the major corridor as well as the entire minor corridor were represented by the Raritan Valley Chamber of Commerce. Finally, the southern sector of the County (subarea "D") involved the Southern Middlesex County Chamber of Commerce.

The staff worked very closely with chamber representatives in contacting those firms and institutions identified. The chambers were also very helpful in updating data concerning these firms and identifying other "prominent" firms that should be included.

The staff, through the auspices of the different Chambers, contacted the firms in question and arranged special "transportation luncheon sessions". The idea of the luncheon format came from the chamber representatives as the most effective means of getting a response from businessmen who were burdened with many other regular business meetings. These meetings were very productive. The turnout was generally large and genuinely enthusiastic.

The luncheon format was a great aid in getting the feedback needed. After a brief formal presentation of the TSM prototype study its objectives and conceptual framework, the staff mingled with the Chamber members answering questions and further explaining TSM concepts. This relaxed atmosphere seemed to act as a catalyst that promoted the kind of input sought from business and industry.

Concurrent with the staff efforts to gain public input in the business sector, attempts were made to gain input elsewhere. The staff put together a brief survey on problem identification and sent it out to the major transit operators, running tranist lines affecting the corridors. While response was low, the returns received reinforced the opinions of the staff and transit operators represented on the Steering Committee concerning transit problems in the County.

The technical staff also called upon the expertise of the County Planning Board and County Engineer's Office for problem area identification, solution suggestions, and data resources. Although this phase was undertaken separately from all other means of problem identification, the similarities between problem areas identified and solutions suggested among the various groups was remarkable. This emphasized the universally well known problem areas existing on the County's transportation network.

The staff, with Steering Committee support, felt that direct contact with local governments would not be necessary at this point in the study as long as TCC input was obtained, since the

localities were represented by this standing committee. The TCC was the parent-body of the TSM Steering Committee and therefore received regular progress reports and was aware of the goals and intent of the study. The staff distributed problem identification sheets to all TCC representatives and received comments from several localities as a result. Various local governmental agencies were also contacted for input on an adhoc basis as data needs dictated.

A multitude of state and regional transportation agencies were contacted for data input throughout the course of the study. The greatest cooperation came from the New Jersey Department of Transportation's Bureau of Traffic Enginnering and the Commuter Operating Agency, both of which were represented on the Steering Committee. Both of these divisions provided a great deal of invaluable data input and man hours in the analysis of recommendations. Other DOT sections and State agencies were also contacted throughout the study with varying degrees of success in obtaining needed data. The Tri-State Regional Planning Commission also provided data and were extremely supportive throughout the study.

B. Review Of Strategies

The TSM technical staff conducted a preliminary review of all the strategy input received from the sources discussed in the previous section. A complete list of all identified problem areas and corresponding suggested solutions were compiled. The problems identified were categorized by location, frequency of identification and feasibility of correction.

The next step in the review process was to determine the impact of alternative strategies to enable the staff to apply the best mix of strategies to a given location. When the work program was initially written, it was decided that consultant analysis would be helpful in this task.

There were several reasons for choosing to use a consultant for this impact analysis. The chief reason was the time constraints of the study. The County, as study sponsor, did not feel that the TSM technical staff would have sufficient time to complete all of the work program tasks and at the same time perform an in-depth review and analysis of the strategy impacts. Furthermore, it

was felt that a consulting firm with staff support could handle the job easily and possibly give a fresh view of the subject not being involved in the other facets of the study. All things considered, using a consultant for impact analysis was considered to be the most efficient way to use available manpower and offered the best possible outcome for the study.

Once a consultant had been recommended by technical staff, the Steering Committee endorsed the selection allowing them to begin the task of analyzing strategy impacts. The staff provided the firm with as much data as was available and as much staff time as was possible. The staff worked closely with the consultant giving background information on certain traffic conditions, development patterns and the like. Meetings were set up with NJDOT to help acquaint the consultant with the corridor and its problems.

When the consultant began the analysis of the candidate strategies, the staff was concurrently meeting with all of the previously mentioned input groups to give them a chance to review and comment on this list of strategies. This included the four Chambers of Commerce, all of whom endorsed the candidate strategies. The TCC called for a special in depth review of the strategies and subsequently endorsed the entire list. Some reservations were voiced by individual localities as a result of this TCC review; these were duly noted for the analysis. Various County and State technical experts were also asked to review the lists and their very useful comments were extremely helpful in the analysis process.

Two additional input sources were added in this strategy selection phase. A group of mayors representing municipalities along the minor corridor met with the staff and reviewed the strategy alternatives for that corridor. They accepted the majority of strategies listed with a few objections and constructive criticisms, all of which were duly noted and incorporated into the analysis process. The staff also held a public meeting to get the general public's reaction to and comments on the Study results to that point. Although the turnout was not overwhelming, there was a good cross-section of County residents in attendance and their comments were surprisingly positive and supportive.

C. Development Of Final Strategies

The technical staff, after the preliminary screening and analysis described earlier, compiled a list of candidate TSM strategies for further analysis. This list was thoroughly reviewed and eventually adopted by the Steering Committee. At this point the consultant began the detailed analysis of the candidate strategies to determine their probable impacts on the corridor.

In keeping with the study objectives (See Chapter 4: Study Design), the selected TSM strategies were to be evaluated in terms on the impacts they generate with respect to traffic congestion, traffic accidents, air and noise pollution, energy consumption, travel costs, transit operations, neighborhood effects and special user groups. The evaluation was to be carried out based on site-specific conditions and in generic terms. However, as it had been determined during the course of the study that data deficiencies and the time required to assemble available data would eliminate the majority of the selected strategies from site-specific analysis, representative areas were, therefore, chosen for more detailed analysis.

For each selected strategy, attempts are made to identify impacts, both positive and negative, for each of the eight (8) impact categories listed above; categorize the identified impacts; and analyze the benefits and disbenefits, by user and non-user groups. User groups include commuters (auto, transit, carpool, vanpool, HOV modes), non-commuters and transit-dependent persons. Non-user groups include employers, transit operators and neighborhood residents.[1]

Due to the data problems encountered, the consultant work was much more involved and required a greater amount of time than was originally anticipated. The technical staff worked very closely with the consultant team, collecting some additional data taking the consultants on field trips to better acquaint them with the identified problem areas and in general offering their professional experience working in these areas as added resource data for the consultant. This cooperative effort compensated somewhat for the data deficiencies and allowed the consultant to finish the analysis in a reasonable amount of time, considering the constraints of the project. By August 1978 the analysis was complete and a draft report submitted for staff and Steering Committee review.

The staff and Steering Committee were, in general, quite pleased with the effort made by the consultants to complete the analysis under the data and time constrictions previously described. After careful review and some general modifications the consultant presented an oral dissertation of their findings at the public meeting in September and the Steering Committee voted to accept the report pending final adjustment recommended by the technical staff.

Briefly stated, the report contains an evaluation of TSM strategies, which are three types:

(1) Traffic Engineering or "supply-oriented" strategies

(2) Transit strategies

(3) Travel Demand Strategies

The approach chosen in the evaluation process consisted of three steps: (1) a systematic generic review of impacts of the various strategy types, so as to provide a basis for the evaluation of strategies applicable in Middlesex County and suitable for the locations identified by the County; (2) an evaluation of individual strategies, using the best available data and professional judgement, and (3) a more in-depth evaluation of supply-oriented strategies for three sections in the TSM corridors which are representative of County-wide traffic engineering problems.

The TSM strategies were evaluated independently of one another as well as in combination. Strategy packages are identified in which basic and supportive generic TSM strategies are listed. In addition, the report combines an evaluation of strategies for specific sites in the TSM corridors, together with the recommendation for a TSM program for Middlesex County.

I. Traffic Engineering

It was found that strategies aimed at improving the efficiency of the highway system through traffic engineering (or supply-related) strategies are among the more effective strategies in reducing traffic congestion, air and noise pollution, energy consumption, user travel costs, and traffic accidents. However, since these measures tend to be short-lived, the improvements they produce are likely to

be neutralized by normal traffic growth. To offset this phenomenon, it was recommended that they be complemented with a set of corridor-wide demand strategies such as vanpooling, carpooling, and rescheduling of work hours.

In addition, more site-specific evaluations were made of the strategies recommended for U.S. 1 between Green Street and Wood Avenue, and finally Milltown Road between Ford Avenue and Kuhlthau Avenue. As was mentioned previously, these sites were picked as representative "analysis zones" for a more in depth problem analysis from which correlations could be drawn about other areas. Based on these evaluations, the following strategies are recommended for implementation at these locations:

Route 1

between

Garden State Parkway and Ford Avenue

- -Resurfacing
- -Widening of the Route 1 approaches by resurfacing the shoulder
- -Improvement of signs and markings
- -Signal adjustment in conjunction with the approach widening

Route 27

between

Green Street and Wood Avenue

- -Re-timing the signal at Green Street (See Chapter VI for more detail)
- -Banning left-turns onto Magnolia and Willow Avenues during peak hours.
- -Installing signal at the intersection of Green Street and Middlesex-Essex Turnpike.

Milltown Road

between

Ford and Kuhlthau Avenue

-Introduction of a reversible lane during peak hours, with left-turns prohibited from the minor direction.
-Banning of parking on Milltown Road during operation of the reversible lane.

II. Transit Strategies

Transit strategies were found to benefit primarily those who currently use transit, and were not deemed likely to produce significant shifts from the auto mode. However, significant spot improvements may be realizable at locations where park and ride facilities, feeder-bus service, railroad station improvements, re-routing of buses, and new bus routes have been proposed by the County. These actions are designed to improve transit alternatives to the automobile for commuters.

The implementation of transit marketing strategies is expected to produce desirable impacts on travel patterns, as they tend to encourage transit use (existing and possible new riders), and can help in making the transit mode a viable alternative for some trips.

Proposed transit strategies which showed merit, but required a more detailed analysis, were the following:

(1) Proposed Re-Routing of Existing Bus Routes to Serve Major Avtivity Centers

A. Routes to Serve Industry

1. Peak-hour Middlesex #8 and Suburban Transit Princeton-Dunnellen buses to serve Kilmer Industrial Area.

2. Peak-hour TNJ #134 buses, both directions, rerouted to serve Talmadge Road Industrial Center.

3. Re-route peak hour TNJ 62-134 buses (or extend from Iselin origin point) to JFK Hospital. Both directions should be rerouted.

4. Re-route TNJ 12-58 peak hour buses to serve Squibb, J&J Permacel, and Cook College area. Both direction should be re-routed.

B. Routes to Serve Other Activity Centers

1. End the following buses on the Rutgers College Avenue in New Brunswick:

Middlesex 14
Bayview Woodbridge-New Brunswick
TNJ 4+134

2. Have the following bus routes pass the Rutgers College Avenue Campus: TNJ 12-58, 60-135

3. Extend the Middlesex 14 to a new Terminal point at Brunswick Shopping Center

(2) New Bus Routes from North Edison to Woodbridge and Menlo Park Malls, and Perth Amboy or Metuchen.

(3) Feeder Bus Services to Railroad Stations:

-New Brunswick
-Edison
-Metuchen
-Metro Park

(4) Park-and-Ride Facilities:

-Edison Station
-Expansion of Metropark lot (Multi-level garage)
-Other feasible locations

(5) Railroad Station Improvements, especially at New Brunswick and Metuchen

(6) Provision of Paratransit Services to meet the travel mobility needs of the handicapped, elderly and other carless disadvantaged persons.

III. Travel Demand Strategies

Demand Strategies which showed promise of long-term positive impacts in reducing traffic congestion, energy consumption, and air and noise pollution, included staggered work hours and vanpooling. Carpooling strategies were found to have somewhat lesser potential value in the TSM corridors. It was recommended that initial implementation efforts for vanpooling strategies be concentrated on employers with more than 500 employees. This comprises 46 percent of the total employment in the TSM corridors. Staggered or flexible working hours were found to be more likely to succeed for businesses that are primarily administrative than for businesses that are tied to delivery schedules and other interindustry requirements. This, however, must be determined from a case-by-case study. Successful work rescheduling programs were found to be more likely at firms employing more than 500 workers or in areas with large concentrations of employment. It was also recommended that changes in work schedules should be coordinated with vanpooling and carpooling programs, so as to avoid disruption of one program for the sake of another. Work rescheduling programs were further recommended to be coordinated with transit operations for the affected locations.

In summary, the consultants found that traffic engineering strategies offered the most promise in reducing congestion --- by as much as 30 percent in some areas. However, the effects of these improvements to increase capacity by themselves would be quickly over shadowed by growth in demand. On the other hand, transit and demand strategies will only result in small, incremental reductions in congestion on the order of 5 to 10 percent, but over time have a more lasting effect in controlling system demand. Therefore, the consultant recommended a coordinated TSM program combining the timely implementation of both groups of strategies.

This recommendation was made by the consultants with the realization that TSM is to be regarded as an on-going program. Furthermore, the desired impact on travel behavior and on the use of the transportation system is achieved through an incremental process, which is continuoulsy refined until one approaches the desired efficiency. This would be accomplished by the implementation, monitoring, evaluation, and adjustment of TSM program which combines the more traditional engineering approach to capacity improvements, with efforts to increase vehicle occupancy in both fixed-route transit and the paratransit, carpool, and vanpool modes. In addition, staggered or flex-time working hours or shortened work week programs should also be investigated for implementation where applicable. A program of this scope offers the most promising opportunity for achieving system efficiency and the related objectives of the TSM Prototype Planning Study.

These recommendations by the consultant were incorporated into the final selection of the TSM strategies for implementation by the Steering Coommittee and technical staff along with all other input received. The results of this selection process are outlined in the next chapter, which briefly describes the types of TSM strategies that were selected for use on the corridors and how they fit the Middlesex County concept of TSM.

CHAPTER 6: SELECTED FINAL STRATEGIES

The final list of TSM strategies for implement was divided into three groupings. The first group included supply-oriented strategies which are aimed at improving physical transportation facilities. These mainly involve traffic engineering improvements on the highway system. The second group of strategies included demand-oriented strategies aimed at managing the use of both transit and highway facilities at the source. These strategies involve efforts to increase vehicle occupancy and shift peak period demand patterns. The final group of strategies included those aimed at improving transit operations in the County. These strategies deal with operational changes in the transit system, improving intra-system coordination, service marketing programs and the overall response of the system to demand within the community.

The selected TSM strategies to improve the efficiency of the highway system (supply strategies) were grouped into eight categories of projects:

a. Signing and Pavement Markings

- -Traffic control signs and markings
- -Informational and advisory signs and markings
- -Standard Pavement markings

b. Signal Timing, Coordination, and Signalization

- -Retiming and multi-phase operation
- -Interconnection and directional progression
- -New signals and signal removal
- -Computer-controlled signals

c. Intersection Channelization and Minor Physical Improvements

- -Provision of turning lanes
- -Intersection approach widening
- -Improved turning radii
- -Removal of sight obstruction

d. Traffic Operational Controls

- -One-way operation
- -Left-turn prohibition
- -Reversible lanes
- -Ramp metering

e. Parking Controls

-Removal of parking
-Limitations of parking duration

f. Private Access Controls

-Limitations on private access
-Consolidation of private access

g. Moderate Capital Construction

-Construction of speed-change lane
-Intersection approach widening
-Construction of ramps and jughandles
-Construction of turning lanes
-Construction of truck climbing lanes
-Construction of pedestrian walkways
-Resurfacing

h. Miscellaneous

-Relocation of Bus Stops
-Coordinate and control the delivery of goods and services
-Roadside Advertising Control

These traffic engineering-type strategies fit well into a general concept of what TSM is supposed to accomplish. They are relatively low-cost projects which in most cases can be quickly and easily implemented, while realistically offering some tangible results at improving the transportation system. This is especially valid when these projects are implemented in tandum as part of an overall TSM improvement package along with other groups of management strategies.

The strategies to redistribute transportation demand in order to reduce VMT during the peak periods were divided into three categories of actions:

a. Employee Carpooling and Vanpooling Measures

-Carpools are most effective with organizations of 250 or more employees
-Vanpools are most effective with organizations of 500 or more employees
-Both are aimed at reducing the vehicular demand on the highway system

b. Rescheduling of Work Shifts Measures

-Establish staggered work hours program either within various large companies or among a group of companies using the same transportation facilities
-Establish flexible work hours program usually more effective in the office work situation
-Reduce work week from 5 to 4 days; increasing number of hours per day, thus shifting peak period.

c. Rescheduling School Hours

-Removes school buses from morning peak
-Reduces (school-children) pedestrian conflicts in morning peaks

Demand-oriented strategies are very low cost strategies with a potential high yield of benefits. They are an integral part of TSM. In general, demand management, exercised in conjunction with highway and transit improvements, amplifies the benefits of those improvements, maximizing system efficiency and capacity. The Middlesex County TSM Program stresses the need for a cooperative effort by the public and private sectors of the community to improve the transportation systems in the County. These demand management strategies, therefore, are an important factor in the County's TSM approach.

Transit in this County is another area of concern for the community. The strategies selected to improve transit services were divided into three categories corresponding to the system's weakness:

a. Transit Marketing Needs

-Develop bus schedules of uniform design and format
-Publish annual transit guide
-Increase advertising and promotion through use of mass media, advertisements in newspapers and possibly developing a transit information telephone center.
-Install bus shelters containing schedule display cases with telephone information number, route identification and schedules of all lines serving the shelter.

-Identify locations requiring bus stops and shelters
-Identify legal bus stops and standarize all bus stop signs throughout the County
-Develop uniform fare and transfer rates

b. Transit Access Improvements

-Rerouting existing bus routes to better reflect demand for service
-Develop new bus routes to service demand where rerouting would be impossible
-Develop feeder bus service to railroad stations for better modal interface
-Develop feeder bus service to railroad stations for better modal interface
-Improve physical condition of railroad station to induce usage
-Improve and expand Park and Ride facilities throughout the County

c. Paratransit Services

-Develop services for special needs of Elderly and Handicapped who do not have access to other systems
-Use service to supplement regular transit services in low-density areas, possibly as feeder service to line haul

In an area such as Middlesex County it is necessary to have a viable, efficient and attractive alternative to the automobile in order to induce some auto users to try other means to travel. Good transit service is even more of a necessity to those who do not have the availability of an automobile. The transit improvement strategies, while primarily aimed at increasing transit usage and reducing auto use, are also intended to provide the most efficient and effective service possible for those who are transit depenedent.

The transit strategies are TSM-oriented in nature. They are relatively low cost, do not require a great deal of time to implement and if properly instituted in conjunction with other TSM actions can have promising results.

Two words that have been prevalent in the development of these strategies are coordination and cooperation. The County TSM Program is predicated on the idea that the strategies outlined in this chapter will be implemented as quickly as a cooperative effort of all parties concerned will allow. Furthermore, this implementation will follow a pattern detailed in this report which stresses the combination of complimentary and reinforcing strategies whose synergistic effect will offer the maximum improvement attainable.

Only through the type of TSM program outlined in this report can the present problems and future growth of Middlesex County's transportation system demand be managed.

CHAPTER 7: IMPLEMENTATION CONSIDERATIONS

A. Intended Impacts

One of the main objectives of the Prototype Study from the County's point of view was to find a viable method with which to gain much needed transportation relief for Middlesex County's overburdened systems. The County made a commitment to work with all parties concerned in the transportation improvement process to test a systematic TSM approach. It was recognized that deficiencies exist not only in the transportation system but also in the present improvement process. It was also, recognized that financial constraints face all levels of government in meeting the needs of localities in solving transportation problems. TSM, therefore, appeared to be a realistic attempt to manage present problems and future demand with limited resources.

The study, therefore, was aimed at achieving workable solutions to Middlesex County's transportation problems. The whole process, as described in this report, culminated in the selection of TSM strategy packages which were intended to accomplish this goal. Putting it simply, the intended impact of the strategies was to "get the systems fixed" by alleviating specific problems in a unified program of project implementation along the study corridors.

The supply-oriented strategies outlined in the preceeding chapter were aimed at improving the efficiency of the highway system through low-cost traffic engineering techniques. These types of strategies appear to be the most effective in reducing traffic congestion, air and noise pollution, energy consumption, user travel costs and traffic accidents in the corridors. These strategies were found to be especially effective when combined with demand management strategies implemented along the same corridors of travel. They also require continuous data updating to determine effectiveness and specify modifications.

The demand management strategies, also described in Chapter 6, are aimed chiefly at controlling VMT and demand in general during the peak periods. They can effectively reduce air and noise pollution, energy consumption and peak period congestion on highways and on transit systems. This is done either by the use of HOV's to reduce overall demand or by shifting the peak period with work hour variations. When combined with highway capacity improvements and transit service improvements, these strategies offer a long lasting, effective method of maximizing total system efficiency.

The transit-related strategies are aimed at improving transit service and marketing for those transit lines serving and marketing for those transit lines serving the Study Corridors. Ultimately, it is hoped that the overall system improvements will encourage continued use by existing riders and have a desirable impact upon travel patterns in the corridors by inducing auto users to try this viable alternative mode of travel. Implemented along with supportive strategies from the other groupings, these transit strategies can have a positive impact on travel conditions within the corridors.

Through careful evaluation by the technical staff of all information received from the input groups (see Chapter 4: Public Participation Section) combined with the consultant analysis and professional experience, target areas along the corridors were identified where specific types of strategies would be applicable. Table 7A outlines the perceived impacts of the traffic engineering or supply-related strategies as having either a positive, marginal or neutral effect on travel conditions in the target areas.

As can be seen by examining Table 7A, Route 27 was identified in all subareas as being deficient in its traffic engineering characteristics. It is along Route 27 that a concentrated and coordinated effort to improve traffic control systems would have the most positive effect. Conversely, except for specific problems identified in certain subareas, Route 1 was least cited as having traffic control problems. However, the incremental improvements completed in each subareas as part of an overall TSM program may prove to be quite beneficial in terms of their synergystic effect on system efficiency. Since both of these roads are under State juridsiction, a cooperative effort with State agencies will be necessary to achieve any improvements there. This issue will be discussed in more detail below.

The Minor Corridor is another site where most categories of traffice engineering strategies will have at least a marginal or positive effect for any of the municipal subareas along the corridor. Milltown Road, being a County road, will require a cooperative effort between County and municipal officials to effect changes. This should allow for speedy implementation of the needed improvements, pending concurrence with State and federal traffic control standards.

While both the demand management and transit strategies were recommended for corridor-wide implementation, their application is most needed in areas of concentrated travel demand. The greatest concentration of development along the corridors exists in the Northern subareas of the corridor. Specific target areas for the initiation of demand management strategies include Metro Park, Talmadge Road, Kilmer Industrial Park, Raritan

Industrial Center and the New Brunswick CBD Area. All of these areas have been identified as having extreme congestion during the peak period on access roads leading into the developments. It is hoped that through a well-planned application of demand management techniques, this extreme congestion can be relieved.

Conjointly with any relief gained through demand management in these specific subareas of the corridors, it is believed that a reduction in travel demand throughout the system will also result due to the amount of travel generated by these development centers. Although, this "system reduction" may not be very significant due to the volume of regional traffic experienced here, it will, when combined with supportive TSM actions, have positive effect on travel conditions in the corridors. It will require a closely coordinated and cooperative effort on the part of the private sector and the County government with support services from relevant state agencies in order to achieve these gains.

The transit strategies will also be targeted at serving the aforementioned industrial centers as well as commercial developments such as the Menlo Park and Woodbridge Shopping Centers and institutional centers such as hospitals, County and State educational facilities, local, County and State government offices and the like. The objective of the transit improvements is to make the system reflect present and future travel demand within the County. In this way it is hoped that the situation which now exists, where bus lines follow outdated routes not serving areas of high demand, will be corrected. The transit system should be made more responsive to the present needs of the community, while also making it flexible enough to adjsut to future development patterns. This will take a cooperative effort involving the local transit operators, County staff and either the NJDOT Commuter Operating Agency or the State Public Utility Commission where applicable.

B. Implementation Roles and Responsibilites

In this section the actors and the roles that must be carried out in order to implement the selected TSM strategies will be specified. The procedures and roles that are necessary to implement supply, demand, and transit strategies will also be discussed.

As prviously noted, supply strategies are primarily concerned with traffic engineering improvements to the existing highway system. Phase one improvements are principally of a maintenance variety involving very low cost and typically taking 6 to 18 months for implementation. As the improvements to the major corridors are on State maintained roads (Route 1 and Route 27), only the NJDOT can initiate action. The County may petition

the State to consider a project but there is no requirement for State responsiveness to the petition.

County and municipal requests for traffic control and maintenance actions must be made to the NJDOT - Bureau of Traffic Engineering. NJDOT must investigate, approve, and implement the project. In the cases of striping and geometric road changes, the Bureau of Traffic Engineering requests the NJDOT Bureau of Maintenance to implement the project, but with no commitment that the request will be quickly implemented. Much time is consumed during these intra-departmental procedures.

Projects implemented along the major corridor will have resulting impacts on adjacent County and local roads. Further phase one improvements on these road systems may be warranted and County and local coordination will be the key to determining improvements. The coordinative nature and functions of the TCC and TSM Steering Committees will greatly aid these cooperative efforts.

As any traffic control project on any road must be reviewed by NJDOT for consistency with State standards, NJDOT cooperation is always vital, even on County road projects such as the Milltown Road minor corridor. Due to the review requirments, State assistance is needed for quick action pursuant to TSM goals.

Phases two, three, and four projects requiring at least moderate capital expenditure which will take a minimum of one to two years to initiate or complete construction. In order to complete these types of projects, sufficient funding is required. Often the primary funding source is the federal government with local matching fund requirements provided primarily by the State.

On the major corridor, the State has complete jurisdiction for project initiation, as indicated earlier. If State money is to be used for construction, NJDOT has complete jurisdiction. If federal money is sought for the project, the project must be programmed through the TIP process. Even if the County were willing to accept the cost to act on State roads. On the minor corridor, however, the County has jurisdictional authority and if motivated to pay for the cost of a project the County can implement it independently.

For all projects, there is the problem of gaining and maintaining local concurrence. During the NJDOT project review phase, localities can effectively "kill" a project by voicing strong opposition at public hearings and meetings. In order to effectively expidite project implementation, local concurrence must be obtained in advance. There are currently vague

requirements concerning municipal resolutions of concurrence for project proposals. Technically, if a project is scrapped after having been advanced beyond the initiation stage, the actor who backs out is responsible for all costs incurred to that point for the project. This provision has never been invoked in actuality and, therefore, has not effectively prevented the loss of local concurrence.

An attempt has been made to remedy this situation by involving localities in the TSM study itself from the beginning. TCC and TSM Steering Committee representatives provided excellent input for localities and business. In addition some localities and business were directly contacted. As further attempt to coordinate implementation measures with them directly in currently proposed.

Demand strategies are primarily concerned with promoting efficiency among highway system user groups. These strategies include vanpooling, carpooling and staggered work hours. The main actor involved in implementation of demand strategies is the County. Coordination and cooperation are necessary between the County and private sector entities, however. Some assistance can also be provided by NJDOT through their State office on vanpooling. For example, the DOT staff can assist in the formulation of matching programs for local industries.

Methods of funding are available from private sources (the industries themselves), the U.S. Department of Energy, and through Federal Aid Urban System (FAUS) transfer funds. In order to obtain FAUS transfer funds for a car or vanpooling project, the TIP process must be followed.

It is expected that the strategy of staggered work hours can be cooperatively arrived at, but problems may arise with car and vanpooling projects due to other problems such as the difficulties in gaining adequate insurance, etc.

Transit strategies are primarily concerned with operational changes (bus routes, fares, etc.) marketing and advertising, and rail station improvements.

Operational changes require a large degree of cooperation between the County and the State. Any route changes, additions, cutbacks, rate changes terminations of service, etc. must be approved by the Commuter Operating Agency (COA), a branch of NJDOT. The County often initiates and investiages these changes such as those mentioned above are proposed to a bus operator not subsidized by the State, The Public Utilities Commission (PUC) must grant approval.

Marketing and advertisng of transit service will rely upon extensive coordination between the County and the various bus operators. The County has recently received State funding to undertake a special marketing program and this will be coordinated with other TSM actions in gaining greater system efficiency.

Rail station improvements are funded from federal and State sources. Local involvement in train station improvements is unclear at this time. New Jersey has recently purchased all stations in the State and local purchase or operation agreements have yet to be determined. It is clear, however, that coordination between State, County, and local levels of government is necessary in order to accurately determine needs and jurisdictions for operations and improvements.

All of the above transit strategies rely heavily upon the need for cooperation throughtout NJDOT and flexibility towards changing needs and system conditions. Effective coordination and cooperation can result in expediting TSM project implementation.

In conclusion, cooperation and coordination is needed among all levels of government, industry, and bus operators. Due to the large involvement of the State, coordination within NJDOT throughout its many bureaus is crucially needed in order to implement TSM strategy packages.

TABLE 7A: SITE-SPECIFIC IMPACTS OF STRATEGIES*

	ROUTE 1				ROUTE 27				MINOR CORRIDOR			
	Area A	Area B	Area C	Area D	Area A	Area B	Area C	Area D	No.Bruns.	Milltown	E. Bruns.	S.River
A) Signa & Pavement Markings	Positive	Positive	Marginal	Marginal	Marginal	Positive	Positive	Positive	Positive	Marginal	Positive	Marginal
B) Signal Timing / Coordination & Signalization	Marginal	Marginal	Neutral	Positive	Positive	Positive	Positive	Marginal	Positive	Positive	Positive	Positive
C) Intersection Channelization & Minor Physical Improvements	Marginal	Marginal	Neutral	Positive	Positive	Positive	Positive	Positive	Marginal	Positive	Positive	Positive
D) Traffic Operational Controls	Neutral	Neutral	Neutral	Neutral	Positive	Positive	Positive	Positive	Marginal	Marginal	Marginal	Positive
E) Parking Controls	Neutral	Neutral	Neutral	Neutral	Marginal	Marginla	Positive	Neutral	Neutral	Positive	Marginal	Positive
F) Access Control	Positive	Positive	Marginal	Marginal	Positive	Positive	Positive	Positive	Neutral	Neutral	Neutral	Neutral
G) Moderate Capital	Positive	Marginal	Neutral	Positive	Positive	Marginal	Marginal	Positive	Positive	Positive	Positive	Positive
H) Miscellaneous	Marginal	Marginal	Marginal	Marginal	Positive	Positive	Positive	Positive	Marginal	Marginal	Marginal	Marginal

Note: Area A: Union Co. Line to Route 1 - 287
Area B: Route 1 - 287 to Woodbridge Avenue
Area C: Woodbridge Avenue to ConRail Overpass
Area D: Con Rail Overpass to Mercer Co. Line

*SEE CHAPTER 6 FOR SPECIFIC PROJECTS UNDER EACH HEADING

CHAPTER 8: IMPLEMENTATION PLAN

A. DEVELOPMENT

The development of the TSM Implementation Plan was an on-going process from the beginning of the study. It was decided at the inception of the program that in order to properly test a systematic TSM concept, it would be necessary to measure the effectiveness of the resulting improvements in the field. This presupposed that the projects recommended in the TSM study could be "quickly" implemented.

As previously noted, a variety of objectives were delineated for the study. One of the most important of these was a desire to gain some measurable improvement of the corridors chosen. In addition it was desired that some means be developed to expedite the implementation of transportation projects. It was decided, therefore, that along with the recommended TSM strategies, County staff would develop a working implementation plan to help insure the timely development of the projects. The implementation plan was to be a guide, outlining the probable time of implementation for each project, the specific responsibilities of each actor involved in a given project, and estimated costs for the projects along with possible funding sources. The staff was also responsible for identifying any forseeable problems in the implementation of projects so that a course of action could be developed to analyze the problems quickly and determine alternative methods of alleviating the situation.

The final selected TSM strategies for implmentation exhibited a wide variation in cost and estimated time of implementation from simple highway maintenance and demand management strategies to more complex road widening and other capital construction projects. The staff was able to classify these strategies into four main groups (See appendix A final selected strategies) based on cost and probable time of implementation. Phase I projects were all those of a very low cost nature which could be implemented during the normal course of maintenance or as operational adjustments. It was estimated that Phase I Strategies could be implemented within 6 to 18 months. Phase II projects were those requiring some moderate capital construction or minimal additional funding.

Phase II Strategies could take from 12 to 24 months to initiate construction. Phase III projects were those of a somewhat more capital intensive nature, where physical improvements and/or capital expenditures for equipment could reach the $500,000 range. Implementation of Phase III Strategies could take as long as 18 to 36 months. Phase IV projects were those of strictly a capital-intensive nature, requiring major capital construction and outside funding, in some cases reaching the million dollar plus range. Phase IV projects are not likely to have construction initiated before 36 months.

As was mentioned earlier in the report, all input groups were contacted after the list of candidate strategies were categorized in the aforementioned phasing groups. The staff, with the aid of the consultant's impact analysis and the active participation of the input groups, was able to determine the most suitable strategies for implementation along the corridors. At that point the actors who would be involved in the implementation of the various strategies were identified and comments and cooperation on the various phases of projects were solicited. This stage of the work was very useful in identifying any project implementation problems and in gaining concurrence on the selected strategies.

By following the procedure outlined and initiating the use of our implementation monitoring framework, the added capability of being able to detail the results of implementation was also gained. This could be done through the auspices of the County as implementation coordinator. This would be accomplished by calling upon the various actors identified in the implementation plan for progress reports on various stages of project development.

B. Plan Outline

As noted above, the goal of the prototype study was selection and implementation of workable TSM strategies. The two preceeding chapters discussed those strategies, giving a general discription of the types of strategies selected, the target areas for their implementation, their intended impacts and the participants necessary to help implement the strategies.

This section of the report details the County's plan for strategy implementation. The plan outlines the responsibilities of various actors in the implementation process, possible funding sources for projects along with time and cost ranges for the different types of projects. It is proposed that the County coordinate the implementation effort through a cooperative program involving the County Transportation Planning and Engineering Staffs. Their agencies will contact all actors involved, discuss the proposed strategy alternatives and analyze the given situation for application of the best possible mix of strategies for system efficiency and community benefit.

The Implementation Plan Chart in Table 8A gives a breakdown of the recommended strategies by implementation phase, indicating time frame and cost range by subarea on the corridor, and identifying general target areas. Further, it categorizes the strategy alternatives according to the three major groupings of strategies and identified the actors involved in various implementation tasks for the different types of strategies within a specific grouping and subarea.

Phase I Strategies, as the chart indicates, are mainly those of the facility maintenance or operational adjustment variety which can be implemented very quickly and easily, usually without much capital outlay. Along the major corridor, strategies in this phase will be the main responsibility of the New Jersey Department of Transportation. Regarding Traffic Engineering or Supply Strategies the County Staff will advise DOT's Bureau of Traffic Engineering of the proposed changes and will analyze the alternatives. Those projects feasible for application will be implemented through the appropriate bureau of NJDOT such as the Bureau of Maintenance, which handles signing, striping and other minor roadway improvements and maintenance.

Where local communities will be impacted directly or where coordination of strategy implementation on the major corridor and an intersecting local roadway is necessary, the impacted community will be contacted by the County to aid in the analysis and implementation of the strategies. Table 8A gives a listing of the localities, along the corridors by subarea designation, which will be contacted directly for assistance in implementation efforts.

Phase I Traffic Engineering or Supply Strategies to be implemented along the minor corridor will be main responsibility of the County, since Milltown Road is a County facility. The County will coordinate all necessary inter-departmental cooperation to implement the improvements. The County will also work closely with the local governments to determine the most beneficial mix of strategies for implementation.

The transit related strategies will fall under the auspices of the appropriate State agency. Any improvements to state-subsidized carriers will be analyzed and implemented with the aid and consent of the Commuter Operating Agency (COA), while the non-subsidized carriers come under the jurisdiction of the State Public Utilities Commission (PUC). In any case, the County will coordinate the analysis and implementation efforts with the support of the affected local communities.

The demand related strategies will be handled by the County, cooperating with the NJDOT Office of Ridesharing for analysis and with the affected businesses and industries for implementation. The County will approach the targeted areas of concentrated business and industrial development to explain alternative demand management strategies in an attempt to determine the most suitable for the needs of the particular companies involved. Also explained will be the package of supporting TSM strategies being applied in other areas to show the total system efficiency and cost-effective approach to be taken.

Phase II Strategies will involve basically the same groups of actors as Phase I. In fact, many Phase II Strategies will be analyzed and/or implemented simultaniously with Phase I packages. Since there will definitely be capital expenditures necessary for this phase of implementation, funding must be sought. For the major corridor, involving strictly state roadways, the County can only recommend that the state fund particular projects. If State funds are not available for the projects, the State must then apply for federal funding. Local and county governments cannot apply directly for federal funds for a State roadway project given current procedures. Section C, describes all available funding programs and sources applicable to the TSM strategies.

As far as the Minor Corridor is concerned, for Phase II Projects the County can act on its own if funding is available. If not, the County or municipalities can co-sponsor the projects for federal funding. The same holds true for most transit strategies requiring capital expenditures as well as vanpool programs.

Phase III and IV contain projects of a higher cost than the preceding two phases and therefore will definitely require federal funding for implementation. Much of what was said about funding in Phase II also holds true for these two phases. However, greater detailed analysis will be required for any projects of this level of expenditure. This, there will be a much more prolonged initiation time for these projects. Coordination will be necessary between NJDOT's Division of Design and County staffs to complete preliminary analysis of all supply-related strategies as quickly as possible to help speed-up funding acquisition.

Any transit-related strategies falling in these two phases will require a great deal of coordination among several levels of government, local, County, State and federal. They may also require special review and analysis by the Urban Mass Transit Administration (UMTA). The County will endeavor to do as much preliminary analysis as possible with other state, and local agencies, again in an attempt to speed-up the funding acquisition process.

This brief explanation, together with the accompanying tables outlines in some detail the County's step by step approach to implementation of the recommended TSM strategies. The following chapter will discuss monitoring guidelines by which the results of this implementation effort will be measured.

TABLE 8A:

MUNICIPALITIES IMPACTED BY STRATEGY IMPLEMENTATION AND IMPLEMENTATION PLAN CHART (PAGES 56-73)

Location:	Municipality:
<u>Major Corridor</u>	
Area A	Woodbridge Township Borough of Metuchen
Area B	Edison Township
Area C	Borough of Highland Park City of New Brunswick North Brunswick Township
Area D	South Brunswick Township Plainsboro Township
<u>Minor Corridor</u>	North Brunswick Township Borough of Milltown East Brunswick Borough of South River

TABLE 8A: IMPLEMENTATION PLAN CHART

PHASE I STRATEGIES
6 TO 18 MONTHS FOR PROJECT COMPLETION
LOW CAPITAL: UNDER $100,000

Location

Major Corridor	Traffic Engineering Supply	Transit Related	Demand Management
Area A	10-Signing and Striping improvements recommended for implementation by DOT-done during regular maintenance could be completed in 6 or 8 months. 7-Signal timing changes recommended for investigation and/or implementation by DOT. 1-Signal interconnect on side streets recommende for joint County/ local implementation-without capital purchases could be done in under 6 months. 13-Operational controls recommended for investigation and implementation by DOT-due to impact analysis necessary and joint State/local legislation, this could take over 1 year.	2-Park/Ride Sites re - commended within existing parking lots of large Commercial developments-requires joint County/private cooperative effort-could be implemented within 6 months. 2-Mass transit service changes to improve access into large commercial developments, industrial/office complexes and major medical facilities-will require coordination between County, state and transit operators could be completed within 6-8 months.	1-Staggered hours programs recommended for those industries not presently using this strategy-will take cooperation between county and private sector-could be implemented almost immediately. 1-Van or carpooling programs for those industries located in extremely congested areas-will require state/county/ private sector effort and 12 to 18 months implementation.

PHASE I STRATEGIES (CONT'D)

Location

Major Corridor	Traffic Engineering Supply	Transit Related	Demand Management
Area B	4-Signing and Striping improvements recommended for investigation and/or implementation by DOT-those done during maintenance could take only 6 to 8 months-others will be longer. 1-Directional signing for large industries and industrial developments-will take County and private sector effort 6-12 months. 3-Signal timing changes recommended for investigation and/or implementation by DOT could be done in 6 to 8 months. 4-Operational Controls recommended for investigation and/or implementation by DOT-impact analysis and joint state/local legislation could take 12-18 months.	1-Provide improved mass transit service into large industrial centers located in this sector-will require joint County/state investigation and coordination with transit operators but could be completed in 6-8 months.	2-Staggered hours programs recommended for large industries and industrial centers to ease congestion-cooperation necessary between county and private sector-can be done quickly in under 6 months. 2-Van or carpool programs for same groups identified above-requires State/County/private sector effort and 12-18 months completion. 2-Improvements in goods delivery scheduling to off-peak requires County/private sector efforts and 6 to 12 months.

PHASE I STRATEGIES (CONT'D)

Location

Major Corridor	Traffic Engineering Supply	Transit Related	Demand Management
Area C	7-Signing and Striping improvements recommended for implementation by DOT-can be done during regular maintenance in 6 to 8 months. 2-Signal timing changes recommended for investigation and implementation by DOT-could be done within 8 to 12 months. 1-Signal timing change recommended for implementation by the City of New Brunswick. 11-Operational controls recommended for investigation and/or implementation by DOT-impact analysis and joint State/local legislation could take 12 to 18 months.	1-Investigate the possibility of a CBD jitney-loop bus service for New Brunswick-will require county/local coordination and 12 to 18 months. 1-Investigate needed transit service improvements for New Brunswick CBD County/State effort that could take 6 to 8 months. 1-Develop park/ride facilities outside of New Brunswick with transit connection-County/state effort impact analysis will take at least 6-12 months.	2-Staggered hours/flextime programs recommended in areas of heavy congestion-will require joint County/private sector efforts and 6 to 8 months. 2-Van or carpool programs recommended for congested locations on corridor-requires State/County/private sector cooperation and 12 to 18 months. 2-Rescheduling of goods deliveries and pick-ups from the peak period to off-peak-will require County and private sector cooperation and 6 to 12 months.

PHASE I STRATEGIES (CONT'D)

Location

Major Corridor	Traffic Engineering Supply	Transit Related	Demand Management
Area D	10-Signing and Striping improvements recommended for implementation by DOT-can be done during regular maintenance in 6 to 8 months. 3-Signal timing changes recommended for investigation and implementation by DOT-could be done within 8-12 months. 2-Operational controls recommended for investigation and/or implementation by DOT impact analysis and joint State/local legislation could take 12-18 months.		

PHASE I STRATEGIES (CONT'D)

Location Minor Corridor	Traffic Engineering Supply	Transit Related	Demand Management
South River	1-Signing and Striping improvement recommended for implementation by county/local staff-cooperative effort could take 6 months. 4-Operational control recommended for investigation and implementation by joint County and local effort-could take 8 to 12 months to legislate changes.	1-Extension of bus service from South River to Brunswick Square Mall recommended for investigation by County/State-coordination with transit operators could be done within 6 months.	1-Staggered hours/flextime recommended for industries in area with employee capacity to do so-requires County/private sector cooperation, could go in 6 months. 1-Van/carpooling programs recommended for other industries-will require State/County/private sector effort and 12 to 18 months to initiate.

PHASE I STRATEGIES (CONT'D)

Location	Traffic Engineering Supply	Transit Related	Demand Management
Minor Corridor			
Cooridor (County) wide	1-Development of rational system of truck routes to curtail conflicts is recommended for joint county/local coordinated investigation and implementation could take 18 months. 1-Enforcement of truck route ordinanaces is recommended for investigation by local officials-analysis could take 6 months. 1-Consolidation of school crossing areas over major roadways to reduce conflict points is recommended for investigation by local officials-analysis could be done in 6 months.	4-Marketing improvement projects aimed at increasing transit usage by selling service and park/ride facilities are recommended for implementation by County officials-comprehensive program could be design-in 6 to 12 months. 2-Transit fare improvement projects for uniformity between lines and to facilitate transfers between modes are recommended for investigation and implementation by State/County/transit operators-could take 12 months. 5-Massive system inventory projects to identify major trip generators and areas of trip distribution so reroutings of lines to serve these areas or new lines can be developed where necessary are recommended for county/state joint effort-analysis could take 12-18 months.	1-Coordinate scheduling of goods delivery and pick-up in off-peak hours-requires joint County/private sector effort 6 to 12 month project. 1-Encourage truck use of higher capacity roadway with modified pricing schemes during peak period and the like is recommended for investigation by County and roadway authorities cooperating with private sector-analysis should take 6-12 months. 1-Introduce van or carpooling programs to employees throughout County; is recommended for implementation by County officials-could be done immediately. 1-Introduction of express shuttle bus (subscription) service to large employment centers is recommended for investigation by County officials-analyses: 6 months.

PHASE I STRATEGIES (CONT'D)

Location

Minor Corridor	Traffic Engineering Supply	Transit Related	Demand Management
Corridor (County) wide		1-Identification of locations for new bus stops or bus shelters is recommended for county implementation 6 to 12 months. 3-Inter-modal coordination improvement projects to facilitate the use of mass transit for a larger segment of the community are recommended for state/county/transit operators investigation and implementation-projects could take 6 to 18 months. 1-Coordinate the improved maintenance of R.R. stations throughout the County-State/Conrail. County effort could take 12 months to work out plan. -Development of an ongoing evaluation of total transit system inadequacies for timely improvements is recommended for State/County joint effort-plan could be operational in 12 months.	1-Rescheduling of work shifts, either through staggered hours or flextime programs, is recommended for investigation and implementation where applicable by County/private sector joint effort-should take only 6 months. -Investigate the possibility of rescheduling school hours to avoid peak period conflict is recommended for County officials-analysis could take 6 to 12 months.

PHASE II STRATEGIES

12 TO 30 MONTHS FOR PROJECT COMPLETION
MODERATE CAPITAL: $100,000

Location

Major Corridor	Traffic	Transit	Demand
Area A	3-New signal installation are recommended for investigation and/or implementation by DOT-detailed analysis will require 12-24 months for completion of project. 3-New signal installations are recommended for county/local joint investigation and implementation-with a good cooperative effort completion of the projects could be done within 12 months. 14-Geometric improvements requiring moderate capital construction are recommended for investigation and/or implementation by DOT-analysis and funding will require 24 to 30 months. 1-Improved highway lighting project recommended for investigation by County/local officials-could take 12 months to get action from utility company	1-Improved access to existing park/ride facility at Metropark is recommended for investigation by DOT-could be done within 12 months. 1-Improvements to Metuchen R.R. station are recommended for implementation by DOT-funding could take 18 to 24 months.	1-Seek Federal funding for vanpool programs where necessary-can take 24 to 30 months.

PHASE II STRATEGIES (CONT'D)

Location

Major Corridor	Traffic	Transit	Demand
Area B	2-Signal installation improvements recommended for investigation by DOT-analysis and initation of project could be done in 12 to 18 months. 1-Repairing of railroad crossing is recommended for implementation by DOT. Could be accomplished within 12 months. 1-Geometric improvement requiring moderate capital construction is receommended for implementation by DOT-analyses and initiation of project could be done within 18 months.	1-Provision of improved Pedestrian access into industrial center is recommended for County/local implementation to provide direct link to mass transit-cooperative effort could complete project within 24 months.	1-Seek Federal Funding for vanpool programs where necessary. Can take 24 to 30 months.

PHASE II STRATEGIES (CONT'D)

Location Major Corridor	Traffic	Transit	Demand
Area C	1-New Signals recommended at Conrail Railroad Crossing for investigation and implementation by railroad authorities. Could take 24 months to initiate. 1-Demand actuated signal installation recommended for investigation by DOT as alternative to signal interconnect or computerization-analyses and funding could take 24 months. 5-Geometric improvements requiring moderate capital construction are recommended for investigation and implementation by DOT-analysis and funding may take 24-30 months.	2-Pedestrian mobility improvement projects are recommended for investigation and implementation by County/local officials-cooperation can help complete project analysis within 12-18 months. 1-Improvements to New Brunswick railroad station recommended for implementation by DOT. Funding could take 18 to 24 months.	1-Seek Federal Funding for vanpool programs where necessary. Can take 24 to 30 months.

PHASE II STRATEGIES (CONT'D)

Location

Major Corridor	Traffic	Transit	Demand
Area C	2-Operational control measures requiring moderate capital construction are recommended for investigation by DOT. Legal constraints and analysis may take 24 months.		

PHASE II STRATEGIES (CONT'D)

Location

Major Corridor	Traffic	Transit	Demand
Area D	1-Demand actuated signal installations are recommended for investigation and implementation by DOT as alternative to signal interconnect-analysis and funding could take 24 months. 6-Geometric improvements requiring moderate capital construction and recommended for investigation and implementation by DOT-analysis and funding may take 24 to 30 months. 1-Repaving of Conrail crossing is recommended for implementation by DOT. Could be done within 12 months.	1-Erection of bus shelters, standard bus stop signs and schedule display cases, where appropriate, is recommended for investigation and implementation by County officials. Process takes 12-18 months.	1-Seek Federal Funding for vanpool programs where necessary. Can take 24 to 30 months.

PHASE II STRATEGIES (CONT'D)

Location Minor Corridor	Traffic	Transit	Demand
Milltown	3-Signal installation improvements are recommended for investigation and/or implementation by County/local officials-cooperative effort can complete analysis and funding within 12 months. 3-Geometric improvements with moderate capital construction are recommended for implementation by County/local officials-in cooperation projects could be initiated within 12-18 months. 1-Operational control with moderate capital construction, the development of reversible lane is recommended for implementation by County/local officials-coordination and cooperation can see project to completion in 24 months.	1-Erection of bus shelters, standard bus stop signs and schedule display cases is recommended for investigation and implementation by County. Process takes 12 to 18 months.	1-Seek Federal Funding for Vanpool programs where necessary. Can take 24 to 30 months.

PHASE II STRATEGIES (CONT'D)

Location Minor Corridor	Traffic	Transit	Demand
South River	1-Demand actuated signal installation is recommended for implementation to replace antiquated existing hardware by County/local officials. Could be done within 12 to 18 months. 1-Expansion of off-street parking facilities is recommended for investigation and implementation by County/local officials to remove parking from Main Street-analysis and funding could take up to 24 months.	1-Erection of bus shelters, standard bus stop signs and schedule display cases is recommended for investigation and implementation by County. Process takes 12 to 18 months.	1-Seek Federal Funding for Vanpool programs where necessary. Can take 24 to 30 months. 1-Seek Federal Funding for Vanpool programs where necessary. Can take 24 to 30 months.

PHASE II STRATEGIES (CONT'D)

Location	Traffic	Transit	Demand
Corridor Wide		4-Information dissemination improvement projects to help publicize mass transit service through: Development of uniform schedul format, annual transit guide, mass media use and telephone information center are recommended for County implementation design and funding could take 12 to 24 months. 1-Erection of bus shelters, standard bus stop signs and bus schedule display cases county-wide is recommended for implementation by county officials-process take 18 to 24 months 1-Introduction of para-transit services for the elderly and handicapped and/or to supplement regular line haul service in low density areas is recommended for investigation and implementation by County/ local officials-process takes 24 to 30 months. 1-Physical improvements of railroad station, project is recommended for implementation by joint State/County effort where necessary-analysis and funding can take 24 to 20 months.	Seek Federal Funding for vanpool programs where necessary is recommended for joint county/private sector implementation-can take 24 to 30 months.

PHASES III STRATEGIES

24 TO 36 MONTHS FOR INITIATION OF CONSTRUCTION
MODERATELY HIGH CAPITAL: BETWEEN $500,000 AND $1,000,000

Major Corridor	Traffic	Transit	Demand
Area A	2-Complete intersection redesigns with some minor capital construction as alternative to construction of grade separated interchanges or other more costly alternatives are recommended for implementation by DOT-preliminary engineering and funding could take 24 to 30 months.	1-Extension of parking facility at Metropark's congested major transit park/ride lot (possibly needing multi-level garage) is recommended for investigation and/or implementation by DOT-impact analysis and funding could take 24 to 36 months.	
Area B	1-Roadway resurfacing is recommended for investigation and/or implementation by DOT-funding could take 24 months. 1-Elimination of signalized intersection on Rt.1 in Edison is recommended for investigation by DOT-determination of need can be made within 6 months and completion of project in 24 months if necessary.		

PHASE III STRATEGIES (CONT'D)

Major Corridor	Traffic	Transit	Demand
Area B	1-Geometric improvements at Woodbridge Avenue exit on Route 1 is recommended for investigation and implementation by DOT-analysis and funding done in 24 months.		
Area C	2-Roadway resurfacing projects are recommended for the Southern end of Route 1 in this section of the corridor for implementation by DOT-preliminary engineering and funding can be done in 24 months. 1-Reconstruction of Conrail R.R. crossing pavement is recommended for implementation by DOT-funding and construction could take 24 to 36 months.	1-Explansion of park/ride facilities at Jersey Avenue Station along with improvements are recommended for investigation by DOT-analysis and funding could take 24 to 30 months.	

PHASE III STRATEGIES (CONT'D)

Major Corridor	Traffic	Transit	Demand
Area D	3-Roadway widening projects for truck-climbing, accel/decel, or bus turn-out lanes are recommended for investigation and/or implementation by DOT-analysis and funding could take 24 months. 1-Geometric improvements to realign a jogged intersection is recommended for investigation and implementation by DOT-preliminary engineering and funding can be done in 24 to 30 months.	1-Expansion and improvement of existing R.R. stations and park/ride facilities where feasible, is recommended for investigation and implementation by DOT-analysis and funding can take 30-36 months.	
Minor Corridor Milltown	1-Geometric improvement to realign a jogged intersection is recommended for implementation by County/local officials-a concerted effort could see construction in 24 months.		

PHASE III STRATEGIES (CONT'D)

Minor Corridor	Traffic	Tranist	Demand
East Brunswick	1-Geometric improvements at 3 intersections and roadway widening for turning lanes is recommended for implementation by county/ local officials-preliminary design and funding can take 24 months (part of TOPICS program designs underway already).		

PHASE IV STRATEGIES

PHASE IV STRATEGIES

36 + MONTHS FOR INITIATION OF CONSTRUCTION
CAPITAL INTENSTIVE: $1,000,000

Major Corridor	Traffic	Transit	Demand
Area A	2-Roadway resurfacing and drainage improvement projects are recommended for investigation and/or implementation by DOT on both Route 27 and Route 1 in this section of the corridor-preliminary analysis and funding could take 36 months. 7-Major roadway widening projects are recommended for investigation and/ or implementation by DOT-analysis and funding for each project could take 36 or more months. 5-New roadway access ramps are recommended for investigation and/or implementation by DOT-analysis and funding will take at least 36 months.		

PHASE IV STRATEGIES (CONT'D)

Major Corridor	Traffic	Transit	Demand
Area B	4-Major roadway widening projects are recommended for investigation and/or implementation by DOT-analysis will take at least 36 months. 1-Massive safety-related project for the removal of roadside hazards is recommended for implementation by DOT-funding could be received within 36 months. 1-Drainage improvement project is recommended for investigation and implementation by DOT on Route 27-analysis and funding will take 36 months. 1-Major roadway widening project is recommended for investigation and or implementation by county officials-analysis and funding will take at least 36 months.	1-Reconstruction of Edison R.R. Station and construction of park/ride facilities is recommended for investigation and implementation by DOT-analysis and funding will take 36 months.	

PHASE IV STRATEGIES (CONT'D)

Major Corridor	Traffic	Transit	Demand
Area C	3-Major roadway widening projects are recommended for investigation by DOT-analysis and funding will take at least 36 months. 1-Roadway widening project is recommended for implementation by County/local officials on Ryder's Lane-design and funding are completed (on-going project) EIS will take 12-24 months. 2-Roadway drainage improvement projects are recommended for investigation by DOT-analysis design and funding will take at least 36 months.		

PHASE IV STRATEGIES (CONT'D)

Major Corridor	Traffic	Transit	Demand
Area C	1-Major roadway reconstruction project is recommended for investigation by DOT-analysis and funding will take 36 months. 1-Construction of new bridge deck with roadway resurfacing is recommended for investigation and implementation by DOT for Albany Street bridge in New Brunswick-design and funding could take 36 months.		
Area D	2-Roadway resurfacing and drainage improvement projects are recommended for investigation and implementation by DOT on both Route 1 and Route 27-preliminary engineering and funding could take 36 months.		

PHASE IV STRATEGIES (CONT'D)

Major Corridor	Traffic	Transit	Demand
Area D	3-Major roadway widening projects are recommended for investigation and/or implementation by DOT-analysis, funding and design could take 36 months. 3-Major roadway widening projects are recommended for investigation and/or implementation by County/local officials-analysis, funding and design could take 36 months. 1-Major safety-related roadway project to remove roadside hazards along Route 27 is recommended for implementation by DOT-funding and implementation could be done within 36 months.		

C. Funding Sources

All of the TSM strategies discussed in this report are eligible for Federal-aid. There are three major sources of Federal-aid highway funding which can be used to finance the TSM program in the County:

(1) Federal-aid Interstate Transfer

(2) Federal-aid Primary System

(3) Federal-aid Urban System (FAUS)

The Federal share of project funding varies by type of system.

The use of Interstate Highway money for mass transit requires that highway plans first be approved for Federal funding, then the State and local officials request that the funds be withdrawn, at which point the federal government (DOT) determines whether the removal of this highway plan will interfere with the "Completion of a unified and connected Interstate system". Middlesex County must ask the New Jersey DOT for funds to finance a mass transit project in place of the highway, if a transfer is desired. Then the State approves the plan, it asks the federal government for funds. If the Secretary of the US DOT approves the plan, the money formerly appropriated for the highway can be used for mass transit. However, the Federal share is reduced from 90-10 for the highway to 85-15 for mass transit. In addition the term "transfer" does not mean that the money used for mass tranist is diverted from the highway trust fund, but is instead appropriated from the general fund.

In general, TSM projects in the Primary and Urban Systems are funded at a 75 percent Federal share level.

Other sources of funds are available for special highway projects related to the following areas:

-Railway-Highway grade crossings
-High hazard locations
-Pavement markings
-Roadside obstacles
-Safer off-system roads (i.e., off the Federal-aid system)
-Resurfacing, restoring, and rehabilitation the Federal-aid Interstate System
-EPA, air quality funds for vanpooling and carpooling
-DOE energy conservation funds

Federal-aid funds from the special program resources for each of these areas are subject to certain matching levels and limitations. Projects to improve railway-highway grade crossings, pavement markings, high hazard locations, and roadside obstacles may also be financed from any of the four major Federal-aid highway funding sources.

In general, the funds used to match the Federal-aid highway funds cannot come from other Federal funding programs: they must come from State and/or local sources. There are, however, three Federal programs which currently can be used to provide possible sources of matching funds for Federal-aid highway programs. They are as follows:

The Local Public Works Capital Development and Investment Act of 1976.

This Act provides employment opportunities in high unemployment areas through expeditious construction or renovation of public facilities. The provisions of the Act are administered by the Economic Development Administration (EDA). The supplementary grants may be used for local matching of other Federal programs. The Federal Highway Administration Division Officies cooperate with EDA in processing applications and providing information. Although initial funds were committed, the Public Works Employment Act of 1977 provided additional funding of $4 Billion.

State and Local Fiscal Assistance Act of 1972 (P.L.92-512), as amended in 1976 General Revenue Sharing).

A State or local area can use any revenue sharing funds under this Act, and appropriated by the State after December 31, 1976, as its share of a Federal-aid highway project.

Housing and Urban Development (HUD) Community Development Block Grants Program.

These program funds available to provide the match for Federal-aid highway projects. The highway expenditures have to be in support of broader community development programs.

The local share for Federal-aid projects in Middlesex County is provided by the State. However, occasionally (for about 10% of the projects) the

County provides the local share on FAUS project on County roads. The County spends an average of three to four million dollars annually for County road projects not in the FAUS system. These projects deal primarily with road and bridge repair work, as well as traffic maintenance.

Financial aid for the transit system is provided primarily by Federal and State funding. The Urban Mass Transportation Administration (UMTA) finances the capital costs at a level of 80 percent federal share (i.e., bus purchases), and operating costs at a level of 50 percent federal share. In Middlesex County, the bulk of the local share is borne by New Jersey DOT, while the County contributes approximately $50,000 annaully for Transit Operating Assistance.

CHAPTER 9: MONITORING GUIDELINES

The last four chapters have chronicled the Middlesex County prototype planning study from strategy selection and analysis through a discussion of intended impacts and the resulting implementation plan. This chapter will deal with the development of monitoring guidelines aimed at both measuring the impacts of implemented strategies and in a broader sense, establishing a framework from which to analyze future needs.

The concept behind the development of monitoring guidelines was guided by four main objectives. First of all, the monitoring of strategy implementation is essential to the successful completion of a TSM project . Second, the monitoring of transportation systems is a very useful tool in the institution of a comprehensive TSM program. The third objective involves the development of monitoring guidelines which foster the use of an on-going systematic program of data collection and analysis aimed at improving the planning process. Finally, the development of an overall system monitoring program would allow for better management of transportation systems and coordination between modes.

The first objective is very important. Under the present system of transportation projects implementation, it takes a continuous and coordinated effort to literally "push through" a transportation improvement project to implementation within a reasonable amount of time. Therefore, it is essential to monitor the planning, design and implementation of TSM projects to assure their successful completion. This prodigious task can be handled most effectively in the Middlesex County case through the auspices of the County Government, working closely with State and local actors in the transportation improvement process. Middlesex County and many other counties have the manpower, resources and position to be most effective in this role . The County, has more of a local interest in accomplishing TSM goals, being closer to the localities and systems than state or regional authorities. Therefore, it it logical, at least in Middlesex County, to conduct TSM programs at the County-level with County transportation an engineering staffs monitoring TSM progress.

The second objective of monitoring existing conditions on transportation systems will result, if implemented, in a preliminary step towards the establishment, of a comprehensive and on-going TSM program. Through such an initial TSM Prototype study it was deemed to be possible to identify local, State or regional data needs and deficiencies, depending upon the scope of the project. Once these deficiencies have been identified, it may be possible to outline a monitoring program designed to establish a sufficient data base for the institution of a comprehensive TSM program. This objective can also best be reached by a study at the County level in situations similar to Middlesex County's. The County, being close to the system and local actors, is perhaps better acquainted with the nature of the problems existing along the facilities and the causes of them. Furthermore, county government in New Jersey due to its intermediary role in the planning process, must deal with all levels of government involved in the transportation improvement program. Therefore, they should be more aware of existing data deficiencies and holdups in the improvement process.

The third and fourth objectives of the monitoring guidelines development are to result in establishment of a systematic data collection and analysis program, while also offering better system management and intermodal coordination through an overall monitoring mechanism. This can be best accomplished by the institution of a centralized data collection agency. This should be designed to be a comprehensive data collection system with the capability of cataloguing data from all transportation systems.Easy access to the data for all interested system users should also be provided.

The minumun "Basic Data Requirements" and necessary "Measures of Effectiveness" for a successful TSM program are catalogued in Table 9A, TSM Data, along with some recommended methods of data collection.[1]

TABLE 9-A TSM DATA
1-Basic Data Requirements-Highway

A. Traffic Volumes: Number of vehicles passing a given point, screenline or cordonline per unit of time.

(1) -Potential Application: applicable to all modes; generally applicable to any time period (peak or off-peak); applicable to any selected locations of interest (intersection approaches, screenline, etc.)

(2) -Procedures: Mechanical counters such as pneumatic tubes, electric contact, radar or infrared detectors can take traffic volumes; manual count programs using field observations; daily and seasonal adjustment factors can be calculated to estimate ADT.

B. Vehicle Miles of Travel (VMT): Total distance travelled in miles by all vehicles for the portion of the transportation system and time period of interest.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest (CBD, corridor, region, etc.)

(2) -Procedures: VMT Survey--vehicle counts taken on a subset of all links of highway system of interest are expanded to represent vehicular travel for time period and portion of system of interest; volumes are multiplied by link distance and then aggragated to represent travel on the portion of highway system of interest.

C. Accidents: Number of accidents involving property damage, injury or death.

(1) -Potential Application: applicable to auto, transit, truck, and pedestrians; typically the time period is computed to obtain annual values; applicable for specific locations and segments of interest for a system; types of accidents are applicable (rear-end, head-on, 90 degree, etc.)

(2) -Procedures: accident report files maintained by police or traffic engineering staffs; computations of accidents total done by hand or by computer (expensive program); several computer estimation procedures also exist, UTPS Program, UROAD, NCHRP QUICK-RESPONSE ESTIMATION PROCEDURE, NCTCOG TSM ANALYTICAL PROCEDURES (these systems require a great deal of additional input).

D. Intersection Vehicle Turning Movements: Number of vehicles turning right and left and travelling straight through on each approach of an intersections.

(1) -Potential Application: applicable to auto, transit and truck; generally applicable to any time period of interest (peak or off-peak, etc.); applicable to individual intersections.

(2) -Procedures: manual traffic counts using field observers to count the number of turning vehicles and straight through vehicles at a given intersection.

E. Vehicle Occupancy: Number of passenger vehicles with 1, 2, 3, 4 or more passengers and average automobile occupancy at selected points or crossing selected screenlines/cordonlines for the time period of interest.

(1) -Potential Application: applicable to all passenger vehicles (eg. autos, vans, pick-ups); generally applicable to any time period of interest (peak or off-peak, etc.); applicable to selected locations of interest (spot locations, HOV lanes, etc.)

(2) -Procedures: field observation recording number of vehicles and passengers per vehicle passing a selected location, taken preferably at 10 to 15 minutes intervals, sample of traffic stream is acceptable; the number and percentage of vehicles in each occupancy group and average overall occupancy are computed using data; there are several good computer programs for estimating vehicle occupancy such as the INDIVIDUAL MODE CHOICE MODELS and UTPS PACKAGES.

G. Travel Time and Delay: Average travel time, in minutes, between two specified locations.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest (peak and off-peak, etc.); applicable to measuring travel time along a specified section of roadway or a designated route.

(2) -Procedures: floating car technique-where a test vehicle is driven over a specified route in a series of runs, timing each run with a stop watch; time lapse photography-where positions at specified points in time are recorded and travel time computed by calculating distance travelled (this procedures also provides data for speed and density computations); moving vehicle method is similar to the floating car technique but only applicable on 2-way routes: license plate method-where either field observers or automatic equipment record the last 3 or 4 numbers of license plates entering and leaving the study area at a given time-later match-ups are made to compute travel time, there is an FHWA computer package for license matching (LICMATCH) available; the UTPS, UROAD package can be used for estimations.

H. Parking Inventory and Usage: Includes the number of parking spaces by type (on or off-street, time limits), average parking cost to drivers, the number and percent of spaces occupied by location within study area during the hour of maximum parking accumulation for the area of interest.

(1) -Potential Application: generally applicable to all passenger vehicles; generally applicable to any geographic area or facility of interest; generally applicable to any time period of interest (peak or off-peak, etc.)

(2) -Procedures: Municipal records usually contain parking supply and usage data from a variety of sources; field counts

of all on and off-street public and private parking supplies supplemented with above referenced municipal records, aerial photos or records of the facility operators; user surveys distributed on windshields or to employers working within impact area to obtain O and D information, trip purpose parking cost, vehicle occupancy and arrival and departure time: usage survey is conducted by a field observer touring a given area at regular intervals (15 minutes or so), license plates and vehicle position are recorded and checked in subsequent tours, simultaneous surveys are carried on throughout study area, average parking diration and turn-over rate can be estimated from survey data for entire study area: UMTA has two analytical aids for estimating parking accumulation-UMTA ANALYTICAL AID-PARKING and AID-FRINGE PARKING (both require extensive input data).

I. Pedestrian Counts: The number of pedestrians passing a specified point, screenline or cordonline.

(1) -Potential Application: applicable only to pedestrians, generally applicable to any time period (peak or off-peak, single signal cycle, etc.) of interest; generally applicable to spot locations or across screenline and cordonline within impact area.

(2) -Procedures: field observation manually counting pedestrians or automatic counting systems.

J. System Inventory: is the detailed assesment of the existing roadway systems, including the number and types of facilities, the number of lanes on each facility and lane width, all operational controls (signalization, signing and striping, etc.), capacity, geometrics and the like to determine the systems capabilities and potential for improvement.

(1) -Potential Application: applicable to all roadway facilities; generally applicable on an annual basis with updates

as improvements are implemented, applicable to any geographic area of interest (eg. political jurisdiction, corridor, region).

(2) -Procedures: local, county, state and regional authorities records supplemented by field observation where data is lacking.

K. General Traffic Engineering Data: are any additional traffic characteristics needed to adequately and accurately describe existing conditions on the system for analysis, the list might include: Peak Hour Factor, overall traffic patterns with seasonal variations, volume-density relationships, the use of traffic analysis zones in obtaining O and D data, speed and volume variations, over time, and various other traffic engineering surveys.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest (peak or off-peak, daily, etc.); generally applicable to any geographic areas of interest (eg. CBD, corridor, region).

(2) -Procedures: some data is available through local, county or state traffic engineering personnel; standard traffic engineering surveys and methods.

2-Measures of Effectiveness-Highway

A. Vehicle Delay: At an intersection, delay is considered to be the amount of time used to pass through the approach minus the amount of time used by an unimpeded vehicle to pass through the same approach; for a route segment it is the average travel time minus the travel time of an unimpeded vehicle. Reduction in delay shows improved system efficiency.

(1) -Potential Application: applicable to all vehicles; applicable to any time period,but generally taken during peak hours; applicable to any intersection or route segment.

(2) -Procedures: manual intersection delay technique uses point measurement conducted for each intersection approach, where the number of stopped vehicles

are recorded at a constant time interval between samples; floating car technique (See Basic Data-Highway under G. Travel Time and Delay); license plate method (See same as above); moving vehicle method (Ibid.); computerized estimations are basically the same as the above referenced section on travel time and delay.

B. Vehicle Stops: Number of times a vehicle comes to a complete stop (or drops below a predetermined low speed). Reductions in the number of vehicle stops exhibits reduced energy consumption.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest (peak or off-peak, etc.) applicable to specified route or intersection approach.

(2) -Procedures: test car method where a test vehicle is driven on specified routes and records the number of stops either manually, using speed recorder, or Greenshields meter; manual intersection delay technique (See A. Vehicle delay-above); time-lapse photography (See Basic Data Requirements-Highway-G. Travel Time and Delay); computer estimation possible through NETSIM package.

C. Accident Rate: At an intersection, the number of accidents per one million entering vehicles, or number of accidents in a study area per 100 million vehicle-miles. This MOE allows a comparison of the efficiency and safety of improvements.

(1) -Potential Application: application to all vehicles; typically computed in terms of annual rate; applicable to selected intersections or project impact area of interest (route, CBD, region, etc.)

(2) -Procedures: accident and traffic count records are summed and compared for rates.

D. Level of Service: A qualitative measure representing various factors affecting traffic flow on a highway, including speed, travel time, traffic interruptions, safety, freedom to maneuver, comfort and convenience, and operating costs at particular volume levels. This MOE can exhibit general efficiency of the system, increased capacity or reduces demand as well.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest (peak or off-peak, etc.); applicable to spot locations, across screen or cordonlines in project impact area.

(2) -Procedures: Highway Capacity Manual shows the level of service to be determined by the V/C ration as well as physical and operating characteristics of the highway facility of interest; levels of service are defined as six ranges (A-F) of traffic flow conditions, specific computational procedures for different locations are described in the Manual.

E. Volume/Capacity (V/C) Ratio: is the ratio of estimated or observed hourly traffic volume on a roadway to the maximum hourly capacity under prevailing conditions. This MOE is a good comparison of supply and demand.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest (peak or off-peak, etc.); applicable to high-way network links of interest (possible, at screenlines, or cordonlines).

(2) -Procedures: manual capacity analysis techniques where hourly traffic volume counts are divided by maximum achievable volumes for links of interest; UTPS PROGRAM UROAD can be used for estimations.

F. Lenght of Queue: is the length, in feet, of vehicles measured from the point of congestion to the upstream point of stopped vehicles or vehicles at travel speed. This MOE measures delay at spot locations and system efficiency.

(1) -Potential Application: applicable to all vehicles; generally applicable to any time period of interest when queue build-up is experienced; applicable to interest and problem segments of routes.

(2) -Procedures: field measurement, where observers are stationed at the beginning and end of the queue and record length of queue and number of vehicles, from data we can compute capacity or service volume at bottleneck, the number of vehicles approaching point of congestion, number of unserviced vehicles at points in time; intersection study where observer records queue length during each cycle on each specified approach of intersection.

G. Number of Car and Vanpools: Obtaining data on the amount of such pools formed by matching or other ride sharing programs to determine (1) the number of new carpool riders by previous mode of travel and (2) the number and percent of daily work trips by carpools, etc. This MOE shows the impact such programs have on VMT and PMT throughout the system.

(1) -Potential Application: applicable primarily to auto users; generally applicable for peak hour usage; applicable to any area of high density travel patterns.

(2) -Procedures: employee surveys distributed through employers working within impact area is most cost-effective and efficient approach to measuring carpooling potential and impact; household surveys are possible but not practical due to random nature.

H. Person-Miles of Travel (PMT): Total distance in miles travelled by person trips over the portion of the transportation system and the time period of interest. This MOE exhibits the effeiciency and use of HOV's.

(1) -Potential Application: applicable to all passenger vehicles (i.e. auto, van pick-up); generally applicable to any time period of

interest (peak or off-peak, etc.); generally applicable to any geographic area of interest (eg., CBD, corridor, region).

(2) -Procedures: VMT/vehicle occupancy survey where vehicle counts and occupancy counts for a subset of all links in a highway system of interest are expanded to represent total person-miles of travel; transit passenger boarding and alighting counts where on-board observers record at each transit stop the distance between stops and the number of passengers boarding and alighting, the number of passengers on-board between the stops is then multiplied by the distance to get PMT for that route segment; some good computer and analytical procedures are available for estimating PMT for a transportation system; UTPS PROGRAM UROAD, NCHRP QUICK-RESPONSE ESTIMATION PROCEDURES and NCTCOG TSM ANALYTICAL, PROCEDURES.

I. Person-Hours of Travel: is the total travel time in hours for all persons travelling on the portions of the transportation system of interest by mode. This MOE exhibits reductions in travel time and delay throughout the system, thereby demonstrating efficiency.

(1) -Potential Application: applicable to all passenger vehicels (i.e., auto, van, pick-up); generally to any time period of interest (peak or off-peak, etc.), generally applicable to any geographic area of interest (eg., CBD, corridor, region).

(2) -Procedures: VMT/Travel Time/ Occupancy Survey, where traffic counts, travel time surveys and vehicle occupancy counts (See Basic Data Requirements Highway) on a representative subset of all links in the highway system of interest are expanded to represent total person-hours of travel, transit passenger boarding-alighting counts is the same procedure as in person-miles of travel above,

merely substituting travel time between stops for distance; the computer and analytical estimation procedures are also the same as PMT estimation procedures with minor modifications.

J. Noise Levels: are environmental conditions measured in dBA at various distances from transportation facilities. This MOE is an environmental measure of efficiency and effectiveness.

(1) -Potential Application: applicable to all vehicles;generally applicable to any time period of interest (peak or off-peak, etc.); applicable to spot locations in project impact area.

(2) -Procedures: field measurement,where decibel meters are used to measure noise levels and develop decibel contour maps; several estimation procedures are available including: GALLOWAY MODEL which estimates noise level at points near a highway, based on information on traffic characteristics; NCHRP 117 PROCEDURE which estimates noise levels manually based on highway traffic and roadway physical characteriseics; NCTCOG TSM ANALYTICAL PROCEDURES-METHOD 14 can be used to manually estimate noise levels associated with bus and other vehicular traffic.

K. Concentration of Pollutants: is the point location concentration of air pollution emmissions; typically measured in mocro-gram per cubic meter or parts per million (PPM). This MOE is an environmental measure of efficiency and effectiveness.

(1) -Potential Application: applicable to various types of pollutants (eg. CO, HC, NO_x, SO_2, O_3, particulates); generally applicable to any time period of interest (peak or off-peak, etc.); applicable to point locations in any geographic area of interest.

(2) -Procedures: field measurement where air pollution detection devices are used to determine point location concentrations; several good estimation procedures are available including:

PROGRAM HIWAY which computes ambient pollution concentrations attributable to motor vehicle traffic; this gives the CO concentration in PPM at locations within a grid around highway facility of interest; PROGRAM APRAC-14 which computes CO concentration contours for an urban area based on highway network link travel data.

L. Tons of Emmissions: is the measurement of total tons of HC, NO_x, and CO emissions from vehicular traffic. This MOE is an environmental measure of efficiency and effectiveness.

(1) -Potential Application: applicable to auto, bus and truck: generally applicable to any time period of interest for which there exists sufficient data; generally applicable to any geographic area of interest (eg. CBD, corridor).

(2) -Procedures: several good estimation procedures are available including: MANUAL COMPUTATION OF EMISSIONS where VTM estimates from traffic counting programs are used in conjunction with EPA vehicle emission factors to estimate tons of emissions by type of pollutant; UTPS PROGRAM UROAD estimates emissions based on VMT and speed; NCTCOG TSM ANALYTICAL PROCEDURES-Method 13 can be used to manually estimate bus, auto and truck CO, HC and NO_2 emissions.

M. Energy Consumption: is the total daily (annual) energy consumption for travel within the geographic area of interest. This MOE is an environmental measure of system efficiency.

(1) -Potentail Application: applicable to all vehicles; generally applicable to any time period of interest (peak or off-peak, etc.); generally applicable to any geographic location of interest (eg. CBD, corridor, region).

(2) -Procedures: several good estimation procedures are available including:

CLAFFEY'S PROCEDURE estimates energy savings on a link, along a route or at an intersection as a function of the reduction in vehicle delay and in the number of stops required; MANUAL ENERGY CONSUMPTION METHOD where gasoline consumption is estimated based on total VMT multiplied by average per mile fuel consumption rates of vehicles with respect to speed; GASOLINE SALES TAX REVENUES estimates energy consumption based on revenues of local gasoline tax; TRANSIT COMPANY RECORDS record the total diesel fuel or kilowatt-hours of electricity consumed by transit operating agency; UTPS PROGRAM UROAD (similar to the above referenced procedure for emissions estimates).

3-Basic Data Requirements-Transit

A. Operating and Maintenance Costs: is the cost of fuel, electrical power, oil, operator and maintenance labor, maintenance parts and equipment required to operate and maintain the system of interest.

(1) -Potential Application: applicable to all transit modes; generally applicable to monthly or annual data: generally applicable on a system-wide bases, although route specific or individual maintenance facility costs can be computed.

(2) -Procedures: transit company records should keep annaul and unit operating/maintenance costs readily availbale in conformance with UMTA FARE requirements; several good estimation procedures are available including: MANUAL COSTING TECHNIQUES use transit service characteristics expressed in terms of vehicle-miles, vehicle-hours or related factors to estimate operating and maintenance costs; ANALYTICAL AID uses simple questions to estimate annual operating expenses for a fixed-route bus system in an urban area with a population of less than 300,000; NCTCOG TSM ANALYTICAL PROCEDURES-Methods 10 and 11 can be used to manually estimate transit operating and maintenance costs.

B. Operating Cost Per Revenue Vehicle-Miles: Is the ration of the costs for fuel, oil, parts, operator and maintenance labor, and other non-capital costs of transit service to the number of miles all buses travel to provide service described in published route schedules.

(1) -Potential Application: applicable system-wide or route specific; generally applicable to any time period of interest (peak or off-peak, etc.); generally applicable to any geographic area of interest (eg. CBD, corridor, region).

(2) -Procedures: transit company records using schedules and route maps to manually compute revenue vehicle-miles and computing this with the above referenced "Operating and Maintenance Costs" (See A. previous page).

C. Operating Revenue: is the annual revenue produced by the operation of a transportation service.

(1) -Potential Application: applicable to all transit modes; typically estimated on an annual basis; generally applicable for the total system, also by route of jurisdiction.

(2) -Procedures: transit company records show the total dollar value of cash, tokens, tickets, monthly passes and miscellaneous revenues for the transit system or any component of the system; several good estimation procedures are available including: NCHRP QUICK RESPONSE ESTIMATION PROCEDURES uses transit patronage estimates from modal split techniques and transit fare structures to manually estimate operating revenues; NCTCOG TSM ANAYTICAL PROCEDURES use an approach essentially the same as the preceeding method,. UTPS PROGRAM UMODEL, UPATH and MATRIX-where UMODEL computes a transit interzonal fare matrix computed with UPATH, then using UMATRIX to compute daily revenue.

D. Transit Passengers: is the total number of persons using the transit mode of travel.

(1) -Potential Application: applicable to all transit modes; generally applicable to any time period of interest (peak or off-peak, etc.) applicable on a route-specific or system-wide basis.

(2) -Procedures: transit company records using total transfer slips collected plus total receipts divided by average fare yields total ridership, allowance must be made for all reduced fares; tally counters used by the operators can also record number of passengers; Transit Passenger Boarding and Alighting Survey (See MOE's-Highway: H. person-miles of travel for procedure description); On-Board Survey is useful in determining percentage of total ridership for each trip purpose or socio-economic class by distributing questionnaires to passengers on-board transit vehicles; several good estimation procedures are available including: UTPS PROGRAM UMODEL and ULOAD (previously described), NCHRP QUICK RESPONSE ESTIMATION PROCEDURE (also previously described, NCTCOG TSM ANALYTICAL PROCEDURES 6,7,8, and 16; ANALYTICAL AID PROCEDURE (See A. Operating and Maintenance Cost).

E. Trip Distance: is the average trip length, in miles, between selected locations within the region.

(1) -Potential Application: applicable to all modes; generally applicable to any time period of interest (peak or off-peak, etc.); generally applicable within a given impact area.

(2) -Procedures: Employee Survey where mailbox questionnaires are distributed at places of employment

to estimate trip distance and travel mode; Household Survey mail, telephone or home-interviews are administered at places of residence to determine trip distance, travel paths, O and D data and travel mode, On-Board Survey (See D. Transit Passengers).

F. Revenue Hours of Operation: is the total number of hours of revenue service operated.

(1) -Potential Application: applicable to all transit modes; generally applicable to any time period of interest (peak or off-peak, etc.); generally applicable to any geographic area of interest or specific routes.

(2) -Procedures: transit company records show hours of service operation; computations can also be made manually using transit schedules.

G. System Inventory: is the detailed assessment of the existing transit systems, including route coverage, rolling stock, transit services supply, etc. in order to determine system deficiencies and needed improvements.

(1) -Potential Application: applicable to all transit modes; typically calculated on an annual basis; generally applicable on a system-wide basis or on a transit operating company by company basis.

(2) -Procedures: transit company records must show detailed equipment inventories and routes of operation, etc.: field observation to determine route and schedule adherence, service reliability, demand and the like.

4-Measure of Effectiveness-Transit

A. Transit Load Factor: is the ratio of passengers on transit vehicles to total seats at selected locations. This MOE demonstrates access to and demand for transit service.

(1) -Potential Application: applicable to all transit modes; generally applicable to any time period of interest (peak or off-peak, etc.); counts can be taken at either maximum load points or screenlines or cordonlines.

(2) -Procedures: field observation where observers at specified locations record for each passing bus, the route and number of passengers; transit passenger boarding and alighting survey (See MOE-Highway, G. PMT for description); several good estimation procedures are available including UTPS PROGRAM ULOAD which estimates person-hours of travel on transit using vehicle occupancy. NCTCOG ANALYTICAL PROCEDURES-Method 9 is used to estimate average daily and peak period bus occupancy for the overall bus system, manually.

B. Transit Transfer Time: is the average time, in minutes, required for transit passengers to transfer between routes. This MOE indicated inter-line coordination and measures system delays.

(1) -Potential Application: Applicable to all transit modes; generally applicable to any time period of interest (peak or off-peak, etc.); applicable to selected locations where transit lines intersect.

(2) -Procedures: comparisons of transit company schedules can be used to produce a reasonable estimate of average transfer time if buses closely adhere to published schedules; field observers at selected location record times of buses passing point and calculate average transfer time from data.

C. Passengers Per Revenue Vehicle-Mile: is the ratio of the number of passengers boarding transit to the number of miles all buses travel to provide service described in published route schedules. This MOE shows system efficiency.

(1) -Potential Application: applicable to all transit modes; generally applicable to any time period of interest, (peak or off-peak, daily, etc.); generally applicable to any geographic area of interest (eg., CBD, corridor, region) or specified route.

(2) -Procedures: revenue vehicle-miles can be computed manually (See B. Operating Cost Per Revenue Vehicle-Mile in Basic Data Requirements-Transit) and taken as a ratio with "Transit Passengers" (See D. Transit Passengers in Basic Data Requirements-Transit).

D. Dependability of Service: is an assessment of service including frequency of transit service, which is the number of buses passing a bus stop per hour; schedule adherence, which is the percentage of buses on each route arriving within specified deviation limits of scheduled times at selected points; hours of operation, which is the time period during weekdays and weekend days that transit revenue service is operated; perceived reliability of service by passengers, which is a subjective assessment of the above by the system users.

(1) -Potential Application: applicable to all transit modes; generally applicable to any time period of interest (peak or off-peak, etc.); generally applicable to any geographic area of interest or route.

(2) -Procedures: transit company records contain all published or planned schedules and hours of operation; field observation conducted at selected locations, the observers record the route number, run number and arrival time of each bus; on-board attitudinal survey (See D. Transit Passengers in Basic Data Requirements-Transit for description).

E. Disadvantaged Ridership: is the total number of transportation disadvantaged riders (handicapped, elderly, etc.) using transit.

(1) -Potential Application: applicable to all transit modes; generally applicable to any time period of interest (peak or off-peak, etc.); generally applicable to any geographic area of interest (eg., CBD, corridor, region).

(2) -Procedures: on-board survey (See A. Transit Passengers in Basic Data Requirements-Transit for description); NCTCOG TSM ANALYTICAL PROCEDURES -Methods 21 and 27 can be used to manually estimate the number of transportation disadvantaged using demand responsive transit or to plan services for them.

5-Basic Data Requirements-Demand

A. Employment: is the total number of employees by destination or changes in total employment within the impacted area, used to determine applicable TSM strategies.

(1) -Potential Application: applicable for all modes of Transportation; generally applicable to peak period travel, annual changes in employment are monitored; generally applicable to project impact area of interest.

(2) -Procedures: survey of employers within target area to determine total number of employees or any changes in employment totals and the reasons for them; State Employment Agency figures can give a guide to the firms of sufficient size to specified programs.

B. Person Trips: is the total number of persons mode, originating and/or destined for the project impact area of interest or passing a selected point, screenline or cordonline for the time period of interest.

(1) -Potential Application: applicable to all modes; generally applicable to impact area of interest and selected spot locations.

(2) -Procedures: household surveys (See E. Trip Distance under Basic Data Requirements-Transit for description); roadside surveys conducted where drivers are interviewed or mailback questionnaires are distributed at survey stations; transit boarding and alighting surveys (See H. PMT under MOE's Highway for description); occupancy counts (See F. Vehicle Occupancy in Basic Data Requirements-Transit); several good estimation proceudres (described throughout this section) are available including: INDIVIDUAL MODE CHOICE MODELS and UTPS PACKAGES, NCHRP QUICK-RESPONSE ESTIMATION PROCEDURES, NCTCOG TSM ANALYTICAL PROCEDURES.

C. Parking Supply and Demand in Impacted Area: (See H. Parking Inventory and Usage under Basic Data Requirements-Highway.

D. Vehicle Occupancy: (See F. under Basic Data Requirements-Highway).

E. Computer Matching Program: is the Physical means by which to match up potential car and/or vanpool members by residence, place of employment and working hours.

(1) -Potential Applicability: applicable to car, vanpools and transit (developing additional service); generally applicable to any time period of interest, primarily peak period; generally applicable to any impact area of interest.

(2) -Procedures: Employee surveys determine the necessary input to the computer matching program, the most widely used and readily available program is the FHWA COMPUTER MATCHING PROGRAM which is made available through state and regional authorities.

6-Measures of Effectiveness-Demand

A. Congestion and Delay at Key Access Point: (See A. Vehicle Delay and B. Vehicle Stops under MOE's-Highway).

B. Number of Car and Vanpools: (See G. under MOE's-Highway).

C. Person Miles of Travel (PMT): (See H. under MOE's-Highway).

D. Person Hours of Travel (PHT): (See I. under MOE's-Highway

E. Energy Comsumption: (See M. under MOE's-Highway).

F. Noise Levels: (See J. under MOE's-Highway).

G. Air Quality: (See K. and L. under MOE's-Highway).

CHAPTER 10: FINDINGS AND RECOMMENDATIONS

A. Introduction

The contents of this chapter outline the results of the entire Prototype Study Project. Middlesex County's approach to TSM has been thorough and methodically detailed. The step-by-step process (outlined in Chapter 4: Study Design) followed by the project staff was designed to allow for expeditious execution of all work program tasks, while also allowing sufficient time for attention to details vital to the success of the project. The areas of discussion contained some of the conclusions which were drawn in undertaking the Prototype Study.

The following sections of the chapter detail findings from the study concerning: 1) the need for further guidance on the requirements for TSM contained in the Federal Regulations governing the Urban Transportation Planning Process, 2) the effectiveness and feasibility for implementation within the corridors of the TSM-type strategies listed in the regulations, 3) the importance of public participation to TSM implementation and a set of recommended mechanism for insuring adequate public input, 4) the necessity of intergovernmental relationships in successful TSM programs, along with recommended methods and mechanisms for achieving effective interaction in the implementation process, 5) the need for a detailed, comprehensive and consistent data base for a well integrated TSM program along with the need to monitor project implementation and the resulting impacts, and recommendations for establishing permanent, centralized data collection systems and monitoring guidelines for this purpose, and 6) the question surrounding the concept of comprehensive TSM studies as the basis for the institution of an ongoing TSM program and Middlesex County's recommended study process.

B. Regulatory guidance

The Federal Regulations are designed to form the basis for a set of procedures by which local governments can develop a course of action geared towards their given situations and aimed at alleviating problems. Therefore, clarity and direction of purpose are important characteristics which should be part of all regulations and their implementation. The following recommendations are aimed at suggesting areas for improving the clarity and direction of the Federal TSM regulations.

A major difficulty in developing a TSM process based on the regulations involves the fact that these regulations tend to be largely descriptive rather than prescriptive and that they are not related concretely to a specific categorical funding program. Additionally the TSM planning process is not defined by the regulations themselves. The regulations apparently were left purposefully vague as to both the methods of analysis and the methods of reporting to be incorporated in TSM programs. Further guidance on these issues appears to be warranted. Areas in which further specific information would be useful are below.

A key question is one of definition.. The regulations indicate that "the TSM element shall identify improvements to the existing transportation system not including new transportation facilities or major changes in existing facilities." It is not indicated what type of change could be classified as major. Is this to be determined by dollar amount, time frame, geometric or physical change, etc? Some sort of explanation should be provided. It is thus proposed that the TSM element be used to identify improvements to the existing transportation system primarily excluding new transportation facilities or major changes in existing facilities with major changes defined as those geometric or physical improvements that would significantly alter the characteristics of a facility, at a very high cost contrary to the stated objectives of TSM, and/or improvements that could not initiate the construction phase within three years. It should further be clarified that moderate capital construction be shown by the MPO (or involved agency) that other alternatives would not achieve the TSM objectives as well as the moderate capital construction project could.

Another key issue involves the actors to be involved in the process. "The regulations state that the TSM element is to be developed and updated by the regional MPO, the State, and publicly owned operators of mass transportation services."[2] It is clear what, if any, involvement counties and other agencies should have in this process. In the case of Middlesex County, New Jersey, the County, has been designated as an agency of the MPO to do TSM work and formulate a County level TSM element. The regulation should be clarified to indicate that such a role is valid. Guidance is needed which would indicate that MPO's should have the option to designate any subregional organizations as formulator of the TSM element. Presently, it is vague whether State or Federal legislation permits bodies other than the Counties to serve as the TSM agency, but this option should be fully explored. It is thus proposed that guidance be developed providing that the TSM element may be developed and updated by the Regional MPO in conjunction with

counties, subregional planning agencies, and large cities where designated, other agencies where permitted by law, and publicly owned operators of mass transportation services in MPO areas. Such guidance could further provide that where other agencies are involved in the process of TSM formulation, the MPO would review all submitted TSM plans, projects, etc. and coordinate them into the regional TSM plan.

The TSM regulations include a large list of TSM strategies to be evaluated by specific areas.[3] It is not indicated whether all TSM-type actions must be considered and evaluated by an area. The regulations also do not address the question of whether stategies, if developed, may be included in the TSM element. (Guidance should be developed toclarify the regulation to make it clear that the examples shown are only potential strategies under consideration. This guidance should further indicate that the feasibility of and need for individual actions may differ with the size of an urbanized area or the extent of its transportation problems.) Such guidance would make clear that all actions within each category need not be fully evaluated if preliminary screening by the MPO or involved agency deems them inappropriate for the impacted area. It may be noted that it would be expected that some actions in each category would be appropriate for any urbanized area and that strategies not explicitly listed may be included in the TSM element; if they are consistent with the overall stated TSM objectives, and have appropriate justification.

The TSM regulations currently do not afford an explicit opportunity to show any evidence of the criteria of selection, subregional coordination, or MPO promotion in the TSM element. The role of local jurisdictions and the MPO's in recommending TSM projects for TIP inclusion is unclear. Whether or not the MPO should do more than collect recommendations from the localities and TSM agency designees to automatically insert them in the TIP in not clear. Guidance is needed to clarify that TSM documentation should specifically stress regionally significant TSM actions such as:

(a) Those reguiring the intergration or cooperation of two or more agencies that relate to actions that have specific geographical identity apart from policial boundaries --- such as arterials, etc.

(b) Those requiring the integration of two or more modes of transport or the establishment of area-wide regulations or non-physical programs that impact on a cliental of users

--- such as paratransit supplements to fixed line and fixed schedule transit, region-wide carpool programs, etc.

(c) Include statements on prioritization decisions in arriving at the TSM element, including reasons why elements submitted by local agencies were dropped or if elements promoted by the MPO were included.

(d) Include statements in successive updates accounting for progress made and problems encountered in moving toward attainment of the previous TSM element.[4]

The regulations now call for the "formulation of overall policy strategy, assessment of candidate measure, and selection, programming and implementation of actions.... to be carried out as part of the continuing transportation planning and implementation process".[5] The meaning of such an overall policy strategy is not clear. No where is it specified how this policy strategy is to be documented or by whom.

In order to clarify this issue, it is recommended that guidance be given indicating that this requirement for the formulation of an overall policy strategy for an area can be met through the development of the TSM element of the transportation plan. Futhermore, annual progress reports on such a strategy should be required and the overall policy should be developed based upon constraints of the long-range element of the transportation plan. These constraints include requirements for consistency with the area's comprehensive long-range land use plan, urban development objectives, and the area's overall social economic, environmental, and energy conservation goals and objectives.

Presently, there is no stipulation within the TSM regulations for the funding considerations of TSM strategy packages. It would thus seem to be reasonable that when TSM packages of projects are formulated, they should be considered as a whole for funding purposes by FHWA and UMTA. As these projects by their package nature are geared towards one specified goal, their "combination" effect must be preserved. Due to the fact that different projects in the package will have to be approved by different divisions with in USDOT, there must be a streamlining of the procedures and requirements necessary to implement all projects of a package quickly across agency lines. Some sort of joint arrangement to expedite approval would seem to be warranted.

The TSM guidelines do not identify the need for cooperation and coordination of efforts on all governmental levels to aid in the initiation and implementation of TSM programs. Guidance is necessary to indicate that the leading developments of TSM strategies, whether it be the MPO, county or other agency, should identify all the actors (departments, agencies, etc.) that will be called upon to implement projects contained in the TSM element. Once identified, these actors would be encouraged to provide their input and involvement into TSM efforts. By providing early input and cooperation among actors needed to implement projects, TSM goals of speedy implemenation and efficiency will be aided.

C. Strategies

TSM strategies offer a wide variety of alternatives to improving transportation systems within the given constraints of the overall goals of the program. In this study all possible alternative improvements were considered for a given situation. An attempt was made to evaluate at least on a preliminary basis any and all suggested solutions for the identified problem areas. As the analysis progressed, however, it became apparent that certain strategies were generally not applicable, while others had severe limitations in regard to their feasibility for implementation.

As mentioned earlier (Chapter I-Roadway System) right-of-way is very constricted on a majority of the primary roads in Middlesex County due primarily to development concentration. These land use charcteristics combined with high regional demand and poor roadway conditions create critical capacity deficiencies on much of the system. This development also, restricts the acquistion of additional right-of-way. In most cases this precludes the use of TSM strategies calling for additional travel lane for preferential vehicle use, bicycle lanes or increased capacity. In addition, the high volume/capacity ratios typically encountered and the fact that demand continues to grow rapidly in Middlesex County (See Chapter I-Demographics) call into question the potential of the use of strategies which call for preferential vehicle lanes by the "take-a-lane" method. Under these conditions the impacts on congestion and air-pollution levels would be totally unacceptable. Enforcement would also be problematical, given the factors of extreme congestion and corridor length. Other studies have indicated that "violations are influenced mainly by the density of traffic in the general use lane".[6]

Further, as indicated above, the density of traffic on the existing Middlesex County road-way network, as a whole, it extremely high, thus this type of strategy would only aggravate that condition.

There were several traffic control strategies whose implementation was found likely to be infeasible politically or hampered by local opposition. Strategies for which little support at all was evident included removal of existing traffic signals and pricing strategies, such as auto ownership taxes, etc. The cooperation necessary to implement these strategies was not found at the local level due to political opposition to such actions. Other strategies found to be politically unpopular and thereby very difficult to address included such actions as parking management, auto-restricted zones, truck traffic restrictions and enhancement, and one-way operations. Community impacts and adverse economical impacts on local businesses are the main reasons cited for opposition to these traffic control strategies. It appears that a great deal of effort would be needed to convince some municipalities that potential overall positive impacts for the system outweigh any adverse local impacts that might occur during the implementation and/or transition phase of operations. It must also be shown that after these strategies are implementated and in use there will be benifits to the community including reduced congestion and delay, reduced levels of air and noise pollution and reduced travel time and cost. Additionally it must further be carefully demonstrated that the business community would benifit from improved pedistrain and transit access as well as from more orderly and efficient truck traffic movement.

There do remain a large number of TSM strategies which can be both effective and politically acceptable in Middlesex County. These strategies (along with some of those which will be more difficult) are included in the list of final recommended strategies for implementation (See Appendix A). The strategies are basically of three types:

1. Traffic Engineering or supply-related strategies, dealing with the physical operation of the highway system.

2. Transit related strategies aimed at improving the overall transit service in the County.

3. Demand-related strategies which attempt to reduce peak period congestions by redistributing transportation demand on all systems.

D. Public Participation Issues

The value of public participation in transportation planning is well documented. The local actors in the planning process, especially in New Jersey, are vital to the implementation of transportation projects, because local opposition of a project can easily prevent its implementation even in late stages of the project. This element of decision making is necessary due to the fact that the localities are most directly affected by changes in the transportation systems serving their areas. Therefore, special efforts should be pursued to involve local actors at a very early stage in the planning process to insure the successful outcome of the planning effort.

The private business sector is another participant which should be involved early in the planning process. The private sector affects transportation systems as much as anyone and stands to gain considerably from any improvements in those systems, provided the changes are practical for use by the private sector. The only way to insure the cooperation and coordination of efforts to improve the system for the maximum benefits to the entire community is to involve the private sector early in the planning process in order to gain their support and approval of the proposed improvements. A comprehensive, coordinated effort to contact the general public, their elected officials and the private business sector of the community, is a necessary element of TSM.

Public participation has always been an important element of Middlesex County's Transportation Planning effort. The County's Transportation Coordinating Committee (TCC), representing all twenty-five of its municipalities, provides an important means of citizen input to governmental processes. The Committee serves as an advisory body to the County Board of Chosen Freeholders on all matters pertaining to transportation funding for Middlesex County. It was partially due to the efforts of the TCC in finding ways of expediting the transportation improvement process that this TSM Prototype Study was undertaken. As described earlier, the TCC had asked the County Planning Board transportation staff to examine the workings of the process and to attempt to determine alternative courses of action in

order to speed up project implementation. The staff with TCC endorsement sought and received UMTA Section IX funding to do a TSM Implementation Prototype Study.

Once the project was initiated, it was decided that a TCC subcommittee of citizen representatives should be formed to supervise the technical staff work and aid in the completion of the study (See Appendix B for chronological record of all public meetings). This was the County's first step to insure adequate public participation in the TSM process. The County, as the study sponsor, took advantage of an already proven mechanism of public input by using TCC representatives on the TSM Steering Committee. These committee members would work with representatives of the local transit operators and transportation planning participants on the local, county, state and regional levels.

The use of the TSM Steering Committee was one of the unique aspects of this study and proved to be a very useful tool in the successful completion of it. The Steering Committee had a dual purpose. First of all, it represented the TCC, the initial public participation mechanism for the study. Secondly, the Committee also served as a framework through which assessments could be made of the interrelationships among the various transportation planning process actors represented on it. As later discovered during the course of the study, the Committee additionally afforded the technical staff a ready source of profitable advice, ideas and manpower. There was a genuine commitment on the part of the Committee members to accomplish the goals of the study and gain some constructive results for Middlesex County.

All Steering Committee meetings were open to the public and held in a generally centralized location in the evenings to allow for greater attendance. The results of each meeting were reported regularly to the parent organizations at the public sessions of the TCC and the County Planning Board. The media also received regular progress reports for more extensive public exposure. The County's quarterly newsletter on transportation "Middlesex County On The Move" was another form of information dissemination for the TSM study.

The County used all of the above sources in a comprehensive attempt to keep the public well informed of the workings and progress of the study. The County's

purpose in its attempts at informing the public of the study's progress was not the result of any Federal mandate. Rather, it was an attempt to establish a report with the general public and the private business sector from which useful feedback might be obtained. There were several "special efforts" carried out in an attempt to get greater public input into the study. This was due in a large part to the excellent past experiences the County has had with public particpation and the genuine worth that is placed on this input by County officials.

The first special attempt to gain greater public input was the convening of chambers of commerce meetings held early in the study (See Chapter 4-Public Participation for details). These meetings were a very profitable opportunity to obtain problem area identification and suggested solutions from those businesses and industries which affect travel in the corridors. The turnout at these meetings was good and the results were excellent. Not only was the kind of input received useful but surprisingly supportive of the study goals and it exhibited a very receptive attitude on the part of the chamber members towards the whole TSM concept. This translated into a great deal of cooperation from all of the chambers of commerce in spreading information and transmitting feedback. It also meant a commitment from several of the coordination of implementation activities.

Special attention was given early in the study to get substantial input form a variety of other sources. The entire membership of the TCC was contacted for their views on problems and solutions. Technical staffs at the County Planning Board and Engineering Office were also contacted along with some state and local staff members. All local transit operators were sent a transit problem survey at the outset of the study, as well.

Results of these special efforts to gain additional input from the above referenced sources were somewhat mixed but generally valuable. Only the transit operators responded with a disappointingly low rate of return on the surveys. However, the little input which was received from the operators did serve to confirm the transit problems identified by a variety of other sources. Most of the input gorups gave a more than adequate response and attested to the already well-known transportation problems existing in Middlesex County.

The real worth of the input came in the form of the realistic TSM-type solutions that were suggested by the various groups, their open criticism of some of the unfeasible strategies and their assistance in the collection of data to assess the impact of the candidate strategies. The TCC was very helpful in gaining local feedback on specific strategies. The technical staffs at all levels were a great aid in obtaining traffic and transit data and giving professional opinions on the feasibility of the given strategies. All of this input was distilled by the TSM technical staff into the list of candidate strategies for further analysis.

At this point in the study the final special efforts for public input were initiated. This consisted of two public meetings and a special session with the mayors of the towns along the minor corridor. The meetings were held with the mayors to present the list of candidate strategies in order to obtain their views and recommendations for the situations in their respective localities. The mayors were quite pleased with the efforts and except for minor points of contention which were noted for analysis, accepted the list of strategies. They generally welcomed any efforts to improve transportation along the Milltown Road travel corridor. This type of meeting was found to be useful in obtaining the support of the local officials for the project list well in advance of the implementation phase, while also identifying possible trouble spots at an early stage to aid in the impact analysis efforts.

The first public meeting was well publicized in the media and held in the evening again to allow for greater attendance potential. This meeting was intended to acquaint the general public with the progress made to that point and present the list of strategies for review and comment. While the turnout was low, there was a good cross-section of the community present and their response was overwhelmingly favorable to the study concept and progress. A second public meeting was scheduled to be held at the completion of the draft report of the findings and recommendations for the TSM study. These public meetings were found to be a useful tool in gauging the acceptability of the study and the support that the general public would give to further implementation efforts.

The role of public participation in the TSM study multi-faceted and a necessary ingredient for success. It served as a useful tool in the identification of problem areas and possible alternative solutions. It also gave a good indication of the acceptability of the TSM concept within the community. Public participation throughout the study was used to gauge the willingness of the local actors to get involved in the transportation planning process without whom implementation is virtually impossible. By involving the public in the decision-making process further cooperation in the total improvement effort may be ensured. Consulting a wide variety of sources also provided several different perspectives on problems and their solutions. It also surfaced points of contention early enough to allow for their consideration in impact analysis.

Based on this study, it is therefore recommended that public participation in a general sense be included as a necessary element in all TSM programs. The institution of a citizens' TCC-type representative body to effectively involve local actors in the entire transportation planning process, and the use of a steering committee in the formulation of a TSM program appear to be effective ways of accomplishing this. The makeup of this committee should reflect the needs of the given area but must involve the transportation planning participants on all levels with citizen representatives for operational success. Another important community segment to be involved in TSM is the private sector. Their help is essential in coordinating demand management strategies and their insight into transportation problems in general as prime users of the system is very useful. Finally, informing the general public input should also be sought at key decision points in the development of a TSM improvement program.

F. Intergovernmental Relations Improvements

A. Introduction

Cooperation and coordination are key words in the transportation planning process. The multiple levels of government involved and the institutional intricacies that must be dealt with makes project implementation difficult. TSM by nature requires a more responsive implementation process. No matter how low cost a TSM project is, under present procedures there is no speedy way of completing the project if federal or

State aid is required to implement it.

Middlesex County's Steering Committee concept was an attempt to cross jurisdictional boundaries and being all transportation planning participants together from the beginning of the TSM project to see it through to its completion. In order for TSM to be successful there must be a coordination of efforts to achieve the common goal of more efficient transportation for everyone. This calls for cooperation not only among all levels of government but also between the public sectors of the community. TSM can only work with a unified base of support from which improvement can be pushed forward quickly.

The intergovernmental relations portion of this study had the purpose of identifying the issues inherent in the existing implementation process and the relationship of these issues to TSM projects. Also sought was an identification of the effects that the process and present intergovernmental relations have on strategy package implementation. Recommendations made below cite areas where the need for improvements in the project implementation process and intergovernmental relations were found.

It must be reiterated that these recommendations do not attempt to create a comprehensive "TSM Process". They do attempt to achieve improvements in the policy making and project implementation processes and to improve the efficiency of inter-governmental relationships. In this way, a more favorable climate would exist in which a TSM Process can evolve. As current TSM requirements are evaluated and refined, even more institutional changes may be required.

In order to better understand the institutional and regulatory structure within which a TSM process must operate in terms of intergovernmental relations, a set of key factors both helping and hindering TSM goals has been identified. The following is a detailed list identifying procedures and relationships that serve to further the goals of TSM in Middlesex County.

(1). -TIP Regulations

1975 joint UMTA and FHWA regulations require the submission of a coordinated Transportation Improvement Program (TIP).8 This coordinated project request program provides an efficient, unified, and detailed list of projects for federal funding. To the extent that a clear, simple list of project proposals is presented in summary form, the goals of TSM may be realized and inter-relationships among funding and projects can be easily seen. Many TSM projects will require some federal funds and therefore a great deal of input goes into the process by which federally-aided TSM projects are created.

(2). -UMTA TSM Programming Requirements

The 1975 Regulations also require the annual fiscal elements of the five-year TIP to contain "TSM" projects in order for UMTA program approval to be obtained. This requirement directs planning bodies to gear a portion of the requested projects from their area to TSM. Such a requirement helps to achieve TSM goals, but it is not clear how much as yet.

(3). -Elderly and Handicapped Regulations

1976 UMTA Regulations address the problems faced by the Elderly and Handicapped concerning transit use. The UMTA Regulations require a program element for projects designed to help the Elderly and Handicapped to appear on both the five-year TIP and each annual fiscal element thereof.

Projects designed to improve transit for the Elderly and Handicapped may in many cases be on existing facilities. These projects usually call for the improvements that are relatively easy to implement. In this manner, TSM goals are fostered.

(4) -Transportation Coordinating Committee (TCC)

TSM goals are enhanced by the existence of the Middlesex County Transportation Coordinating Committee which provides local input and County guidance into transportation policy decisions. The TCC plays an important public participation function by bringing together many different interests in one forum.

The TCC advises on transportation projects that should be designed and implemented with available State and federal aid. The TCC attempts to approve a project generally only when there is evidence of local concurrence throughout the County concerning the proposal. Also, the County TCC tries to take a realistic look at project proposals and back those with a reasonably good chance for implementation. (This emphasis may cause an ignoring of needed projects simply because they have never entered the implementation process when first needed and now are too difficult to move through the process).

By providing early access to localities for their concurrence (a necessary ingredient for implementation) and by providing guidance for the unified County TIP in prioritizing projects, the TCC serves as an entity that enhances the TSM process.

(5) -Municipality-County Relationship

The relationship between municipalities and the County is probably the most efficient one that exists. This is evidenced in part by the results of a questionnaire distributed by TSM staff to forty planning professionals and public representatives. The results show clear evidence of a strong and growing relationship (See Appendix for the questionnaire and results).* (The TCC is the best representation of this relationship).

Many transportation project proposals result from informal contacts between localities and the County through Public Officials' comments and those of the TCC members. On many transit projects, the County will "sponsor" municipal project proposals and the work of the County Planning Board Transportation Staff in planning and initiating project applications is helpful.**

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*This questionnaire does not attempt to be a statistically accurate sample, but provides an indication of opinions through a combination of staff and committee experience.

**The County Transportation Staff has simplified the procedural description that a municipality must follow in order to apply to the NJDOT for federally-funded road projects through a NJDOT Action Plan Summary. Hopefully a simplification of the description will result in better municipal understanding and quicker project advancement.

(6) -TIP Priority Designations

On road projects, initially the County and municipalities develop the TIP which includes all requested and approved projects receiving federal funding. The Middlesex County TCC with staff assistance analyzes the proposals, establishes priorities, and informs the Board of Freeholders and the NJDOT. This prioritization was most recently based upon estimates of how easily a given project can be implemented. It should be noted, however, that this emphasis is the unfortunate result of not implementing projects as quickly as they are needed.

This County emphasis on backing more easily implementable projects does, however, enhance the TSM process by focusing on expediting projects that can be completed relatively quickly.

(7) -NJDOT Northeast New Jersey Transportation Coordinating Committee Relationship

The relationship between the NJDOT and the NE NJ TCC indirectly enhances the TSM process. State initiated road and transit projects both regional and inter-county type must be reviewed by this body for recommendation to the Tri-State Regional Planning Commission.

The NE NJ TCC provides access to regional decision-making for municipalities and Counties through the freeholder and mayoral representatives.

The ultimate implementation of projects will realistically require local input and approval, therefore, this body will provide "advance warning" of potential trouble spots. In this manner, the implementation process will be eased and indirectly, the TSM goals will be aided. There is no "administrative", operative requirement, that priorities be given to TSM projects.

All of the above descriptions of relationships and procedures can further TSM in Middlesex County, New Jersey. The following list is a basic outline of relationships and procedures that may be applied generally to similar areas in their support of TSM:

(1) -TIP regulations of UMTA and FHWA---Reguires a unified list of projects for federal funding with multiple review points.

(2) -UMTA TIP approval requirements-- Directs planning bodies to gear a portion of project requests to TSM.

(3) -Elderly and Handicapped Program regulations (UMTA)-- Requires program element for E&H Projects many of which are primarily on existing facilites and easy to implement as per TSM goals.

(4) -Existence of a "TCC-like" Body-- Involves local officials, business, transit operators, citizens, and other representatives in planning process; provides access for local interests and guides TIP formation.

(5) -Existence of local (or urbanized area) transportation planning and engineering staff-- Aids in policy formulation and project implementation through technical support and coordination for governments of the area.

Close working relationships are necessary between these levels.

(6) -TIP prioritization based upon implementation potential----- Provides for a realistic coordination between TIP Projects and implementation feasibility (funding constraints, intergovernmental tie-ups, etc.). This can lead to backing of relatively easy to implement TSM Projects. It should not be assumed, however, that other "need" considerations should take a "back seat" in the prioitization process.

(7) -Opportunity for local input into regional decision-making-- Provides advance warning of potential trouble spots concerning needed local concurrence on projects.

Despite these factors supporting TSM and its goals, there are also several problems which tend to hinder effective TSM planning and implementation. These include:

(1) -Local Concurrence Requirements

The TSM process is hindered by the vague requirements that presently exist concerning municipal resolutions of concurrence, official request and justifications for project proposals. Although all municipally-initiated projects requiring federal funding must have resolutions submitted to the NJDOT, this requirement is often unclear or unknown to localities.

With respect to locally initiated proposals concerning transit projects, the Middlesex County Planning Board transportation staff recommends a local

resolution, however, there is no specific requirement for one to be provided. Later in the implementation process for both highway and transit projects, the need for public hearings, environmental impact statements, and the like creates the possibility that localities will abandon a project under constituent pressure.

Technically, if a project is scrapped after having been advanced beyond the initiation stage, the actor who backs out is responsible for all costs incurred to that point for the project. Although this provision has been invoked on occasion, there is no consistency in its application. If NJDOT agrees with the abandonment, no money will be requested, but the process by which agreement is reached is cloudy. These sometimes unclear regulations and procedures concerning local resolutions and concurrence for project proposals result from a poor information flow between NJDOT and localities and place roadblocks in the way of timely project implementation. There is no requirement for packages of projects implemented which are to be in combination with each other to be developed simultaneous, as well.

The results of the questionnaire indicated that by a two-to-one margin, those polled agreed with the statement that "the biggest obstacle to project implementation is the loss of local concurrence and backing that occurs during public hearings and meetings in the NJDOT Review Phase". One public representative

polled stated that before projects are to be initiated, "municipalities should do their homework first". However, insufficient consideration to lower cost alternatives that identify and evaluate combinations of TSM projects might be implemented quickly and be more acceptable to the public who are directly affected.

(2) -Project Application Procedures

Another procedure that adds time to the project implementation phase is the two-step procedure for project requests. For projects initiated by municipalities of the County, proposals are considered first by the Middlesex County Transprotation Committee (TCC) for inclusion of the project on the County TIP.

Following approval by the TCC and the Board of Chosen Freeholders, the proposal is sent to the Tri-State Regional Planning Commission then forwards road projects to NJDOT for submission to FHWA and transit projects to UMTA for final federal review with NJDOT notified for comments. If approved, the project will then be officially included in the TIP.

Following the above procedure, the project initiator must then apply specifically to the Division of NJDOT that handles the particular type of project involved. Highway projects go to the Local Aid Bureau, while transit projects go to the Division of Commuter Services. At this point, intensive review within NJDOT begins.

(3) -Municipality/NJDOT Relationship

A key relationship that may hinder the TSM process is that between municipalities and the NJDOT. Many key project proposals are formulated by the individual municipalities. In many cases, these municipal projects will be of a magnitude and cost that is consistent with TSM goals because they may be lower cost alternatives.

Although the relationship between the municipalities and Middlesex County if effective, the municipality is responsible for the actual application requesting federal aid for projects-(all road projects; County oftern "sponsors" transit project requests). The official application process is both lengthy and difficult to understand. The process is explained in the voluminous NJDOT Action Plan.

The difficulties and time span involved with this application procedure are very important because the federal money used in virtually all significant projects must be distributed by the State through the NJDOT. These application difficulties hinder the municipality-NJDOT relationship and therefore the TSM process as well.

The questionnaire asked for an evaluation of the municipality-NJDOT relationship. Both professional staff and public representatives rated this relationship as being highly unfavorable. A representative of NJDOT stated that this relationship was "limited in any case". Perhaps

this comment gives some insight into the problem. Since all project requests must be submitted by the initiator to the State, and all FHWA and UMTA funds are channeled through the State, except planning funds, the municipality/NJDOT relationship should certainly be better than "limited".

(4) -NJDOT Internal Procedures

With respect to capital projects requiring Federal or State funding, the determination of the Level of Action Committee within NJDOT can also be an obstacle to the TSM process.* The level of action that is assigned to a particular project will have significant impact upon the steps necessary for implementation. "Level one" projects are those of major action with significant effects and likely to produce significant changes in land use and traffic patterns. "Level two" projects are those of major acton with no significant social, economic, or environmental effects. "Level three" projects are those of non-major action usually done within existing rights of way on existing facilities.

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*The Level of Action Committee is composed of Chief, Bureau of Surface Design (State highway system) or Chief, Bureau of Local Federal Aid Programs (FAUS or FARS projects) as chairperson; Director of the Office of Community Involvement, Chief of the Bureau of Environmental Analysis, Director of the Division of Right-of-Way, Chief of the Bureau of Landscape, the area or project Engineer, and the Chief of the Bureau of Project Location. The Committee meets after projects have been assigned by the Director of Transportation Planning and Research or the Director of Engineering and Operations.

Level one and two projects will require varying numbers of public meetings, hearings, environmental impact assessments and statements which can significantly delay project implementation (8-14 years) if not actually preclude it.

Level three projects which in some cases mirror the TSM goals, do not require the types of delaying mechanisms described above and can be implemented in approximately two years.

The workings of the Level of Action guidelines are in some cases vague and leave room for interpretation. For example, a level one project may be one that precipitates significant change in traffic volumes or patterns. Questions concerning how much of a change is deemed significant and how much right-of-way acquisition is needed to be considered significant are critical.

In some cases, the impact of a project may be overstated and the project will have to go through the cumbersome procedures of level one or two designation. This may be especially true for TSM-type strategies which attempt to effect change but also are geared to existing facilities and fast implementation.

Although some flexibility in categorization by the committee is desirable, too much discretion hinders TSM goals. TSM relies upon the interaction of a combination of projects and one or more of them being overstated for impact would hamper system effectiveness significantly.

The current method of level selection and the unclear and perhaps restrictive category descriptions delay project advancement and implementation. This hinders the federal regulatory emphasis on implementing TSM combinations of projects.

In addition, there is what appears to be much more than the usual amount of "red tape" and lack of communication between and among departments and bureaus in an agency as large as NJDOT. This adds to project delays and hinders TSM goal achievements.

Many TSM combinations of projects rely upon traffic control measures such as signing, striping, signalization, etc. When a municipality desires a traffic control project on a State road, the municipality must make a request to NJDOT's Bureau of Traffic Engineering . NJDOT must investigate, approve, and implement the project. In the cases of striping and geometric road changes, Traffic Engineering will request NJDOT Bureau of Maintenance to implement the project. Much time is consumed during these procedures.

When a traffic control project lies on a municipal road, the municipality must notify NJDOT which will review the project for consistency with State standards. This procedure delays implementation as well and thwarts TSM goals.

(5) -Project List Development

In the development of transportation projects, initially the County, with input from the municipalities, develops the Transportation Improvement Program (TIP).

When the County or municipalities specifically request the project by way of an application, the project must be included in the State's "105" Program which serves as the State's request list for federal funding for a given fiscal year. The State can choose not to include a project for any reason. The County recommendations are part of the input into the coordination of the "105" Program.

At this point, the NJDOT reduces the State "105" Program into the Annual Construction Program which contains all projects that will go to bid in some phase for that fiscal year. This reduction is usually based upon financial constraints, but this is not clear. Due to the inherent financial limitations on the number of implementable projects, priorities must be identified. The actors who are closest to the projects, the County TCC and County Planning Board and its transportation staff and the municipalities, do not have any input into the "cutting process" that results in the Annual Construction Program. As a result of this situation, the priorities that are finally established by federal and state governments may not reflect the real needs of the County, to the extent that efficiency may be sacrified by these procedures, the TSM Process is hindered.

In this regard,it is noted that the questionnaire statement "NJDOT policies are consistent with the needs and interests of Middlesex County" received one of the strongest disagreement ratings of the entire survey from both professional staff and public representatives.

(6) -County Jurisdiction and Funding

Currently all federal funds from both the Federal Highway Administration and the Urban Mass Transportation must be channeled through the NJDOT before they can be allocated to counties or municipalities.

Since the County is the key link between the large federal and State transportation departments and the municipalities, it is the most appropriate agent to gear its expertise towards local staff support on transportation matters.

The County, however, has two jurisdictional problems that hinder the planning and implementation process. Firstly, although the County has planning jurisdiction for project initiation on County and local roads, the funding from federal sources must come through State channels. Secondly, on State roads, the State has jurisdiction. A project proposal can be recommended to the state by the County, but only the State can initiate action upon it.

Many TSM-type strategies may be among projects that are held up or denied due to these blocks to efficient implementation. In this manner, the TSM process is certainly hindered. It should not be concluded, however, that jurisdiction should be in any way altered.

(7) -NJDOT Spending Problems

The NJDOT seems to have difficulty in actually spending all of the money that is allocated to New Jersey through FHWA and UMTA funding programs. This may be traced to two factors.

First, there is a lack of matching funds available to NJDOT.* When the State cannot provide a fraction of the cost, (more than half and up to 90% of the cost in some cases is granted by the federal government)/ available federal funds may not flow to the State at all, or at least no in a timely manner.

It must be noted that when changes in revenue sharing made it possible to match federal funds, projects had to be iniated. When projects on the TIP were in the preliminary phase money was available to begin them, presently, and in the foreseeable future, projects are reaching more advanced stages of implementation coinsiding with addition of a newly approved TIP project proposals at a preliminary phase of development. These latter phases are far more costly than NJDOT matching fund capability can accomodate at present levels.

A Second possible reaseon cited by NJDOT is that the County may not formulate or coordinate a sufficient number of legitimate project requests to gain federal funding. This may be due to problems stemming from the local concurrence requirements discussed earlier. Certainly any inability to make use of available grants is a hinderance of the TSM process.

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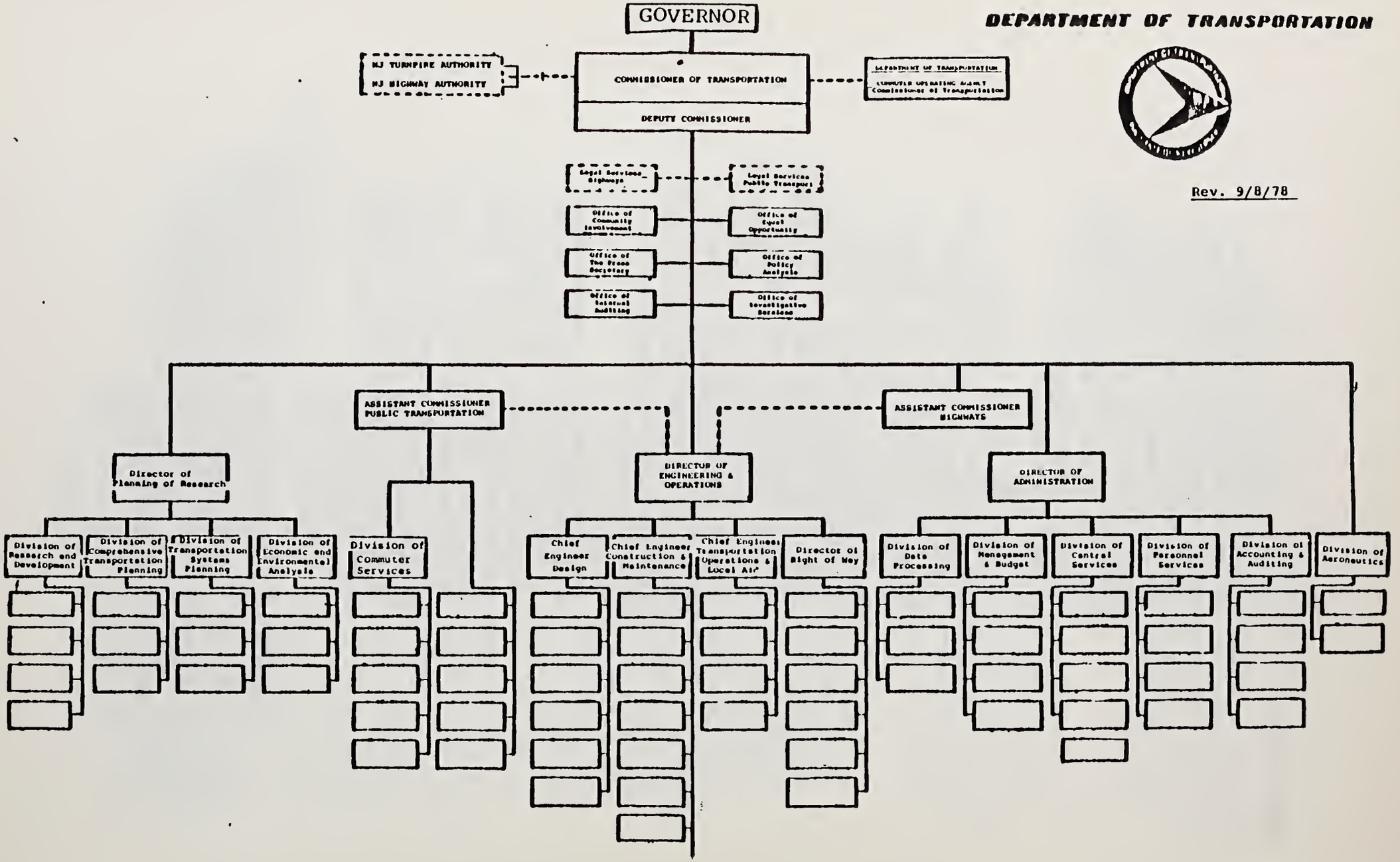
* Although NJDOT has stated that it has never lost federal money because of the absence of State matching money, the State often finds itself in a position of "serious concern" when it is pointed out that there is a peaking of TIP construction projects that will require major amounts of federal funds and State match.

DEPARTMENT OF TRANSPORTATION



Rev. 9/8/78

(8) -Tri-State Regional Planning Commission Involvement

Most projects that require federal funding and go through the TIP process are not of a regional nature. Many TSM-type projects involve small, local transportation system improvements which will not affect a large regional area.

As has been noted throughout this report, all federally funded project proposals that will affect Middlesex County whether initiated by a municipality, County, or State have to be reviewed and endorsed by the Tri-State Regional Planning Commission since Tri-State is also responsible for forwarding approved projects to NJDOT and UMTA. These procedures, which are required by federal regulations, may hold up the processess of policy initiation and project implementation. Project proposals must undergo an extra layer of review and analysis. Additionally, the projects must also be circulated to the subregions for A-95 review. These procedures add delays to the initiation and implementation processes. Although Tri-State procedures are not overly slow, this review step delays non-regional projects to some extent.

The N.E.NJ TCC has taken the position that Tri-State involvement in non-regional projects should be kept to a minimum. Since most TSM projects are of a non-regional scope, Tri-State review procedures should be minimized in order to speed project implementation. It must be stressed,

however, that review procedures carried out by Tri-State tend to be much less of a hindrance than delays encountered at NJDOT.

(9) -TSM Data Deficiencies

The TSM process is hindered by the lack of a consistent source of data for the transportation systems in the County. There is a fairly reliable bank of transit data including ridership figures, origin-designation information and occasional passenger survey results. Highway system data, however, is insufficient for analysis needs.

A critical problem is that there are too many sources of current data which are not coordinated. The State, County,and municipal governments all are responsible for some data collection. A lack of adequate funds is cited at all levels as the reason for poor monitoring procedures. Information is collected solely on an ad hoc basis on the county and local levels. Some systematic data collection is done by the State, on State and major local roads, but even this is erratic. Yearly traffic counts are conducted at some premanent stations. Major stations have counts taken one week per month, while minor stations are taken one week every two months. Random one-day counts and ad hoc counts for specific projects are also taken. All of the above types except the permanent stations and ad hoc counts are conducted on a rotating basis over a five year period.

It is clear that there is no complete, consistent monitoring of the existing road and transit systems within the State government itself. In fact, many

sources must be sought out for adequate information. These procedures both limit the necessary information needed for TSM and add to the implementation time of projects. In this manner, the TSM process is hindered.

(10) -TSM Language Interpretation

It is possible that the very language of the TSM guidelines and interpretations of them can lead in some cases to situations that can hinder the TSM process.

The goals of efficiency and effectiveness in comprehensive transportation planning may not always coincide with low-cost projects. After investigation of alternative strategies, both county and localities may decide that a high or medium cost project at one location may be necessary to achieve maximum benifits from a package of other low-cost projects. In this situation, the TSM goals may be better acheived by planning the high or meduim cost project in conjunction with other low-cost projects.

If it is shown that such a situation exists,TSM guidelines should encompass it. In short, the interpretation of the TSM language should not be restrictive.

All of the above descriptions of relationships and procdures that hinder the TSM process are related to the situation in Middlesex County, New Jersey. The following list is a basic outline of hindering relationships and procedures that may be applied more generally to similar areas:

(1) Provisions for local project concurrence and its implication-local resolution provisions and

ambiguous regulations for penalties for "backing out" during implementation; insufficient TSM consideration.

(2) Project application procedures and delays due to relationships between initiator and higher levels of governments (especially State DOT's).

(3) Local/State relationships-difficulty in understanding project application and implementation procedures; low level of direct interaction concerning project development.

(4) Delays in key decisions concerning project development and implementation at state levels (regional levels as well)-review committees, inter-bureau delays and "red tape", especially those related to TSM-type improvements.

(5) Project list development-problems of who determines priorities and lack of local and county input into state prioritization and cutback decisions.

(6) Jurisdictional problems and their effect on policy making and project implementation-conflict between project initiator and actor with jurisdictional authority over funding or construction.

(7) Fiscal restraints and problems with achieving state matching fund requirements for federal grants.

(8) Relationships between municipalities, counties, states, and metropolitan planning organizations delays and review procedures.

(9) Data deficiencies for transportation systems and their impact on TSM-type planning analysis.

(10) Possible narrow interpretations of TSM guidelines, by actors in the policy-making process and by the federal government.

The factors described above have been analyzed, resulting in a set of recommendations designed to improve the intergovernmental relationships and procedures affecting transportation in Middlesex County, New Jersey. The recommendations encompass relations and procedures concerning municipal, county, state and regional levels of government and are categorized accordingly. In addition, the recommendations are broken down when possible into categories affecting decision making and project implementation.

It must be noted that during the course of this study, there were three different adminstrations in charge of NJDOT. Under the present administration, efforts have been instituted to try to improve the efficiency of NJDOT procedures. Some of these efforts are consistent with the recommendations made below. For example, NJDOT has planned a revision to the Action Plan, has urged local engineers to conduct project feasibility studies prior to TIP inclusion, has invited local officials to participate in Level of Action Committee meetings, and has urged County TCC's to prioritize their TIP Annaul Elements. It is hoped that these improvements can be expedited and others initiated in order to improve the procedures by which projects are planned and advance. The recommendations resulting from analysis conducted during this study are as follows:

I. MUNICIPAL LEVEL

A. Decision Making

(1) Furnishing of Local Resolutions

Localities should be required to furnish official resolutions for specific project proposals before the TIP inclusion process begins. The County TCC should

not consider any project proposal without an official resolution. Before the State initiates a project, a local intent and backing will be shown from the beginning and may cut down on the waste of time and funds on projects that are scrapped in later stages due to lack of local concurrence. A project justification sheet should be completed and attached to the local resolution. The justification should include discussion of low-cost project combinations for the problem addressed by the particular proposal. If the project is not low-cost, there should be evidence that low-cost alternatives were considered and the reasons for their rejection stated.

(2) Consultation Between Officials and Planners

Municipal TCC representatives should be required to meet regularly and consult with municipal planning personnel and governing bodies concerning low-cost approaches to solving transportation problems. Municipal views on the projects that are TSM relates should then be reported back to the TCC. This provision would provide better coordination of the planning process. By increasing the interaction and information levels between local and County bodies, TSM goals would be aided. A unified front between these levels would aid in project development, especially when a project is fully understood and backed.

(3) TCC Attendance Requirement

TCC attendance is vital to promote the local-County relationship. If localities do

not attend, problems may arise due to low information levels on planning project. It is better for all interested parties to give their input to the TCC before the project is advanced than later when a project has progressed toward implementation.

A possible measure to encourage attendance is to require that the municipal representative attend TCC meetings when projects wihtin their specific jurisdiction are recommended for endorsement. Mayors should be notified of attendance since their designees are the persons who should be in attendance.

B. Project Implementation

(1) Project Application Procedures

The current two step procedure for project applications must be modified. If a prior resolution for a project is furnished by the localities involved and the project has passed through the TIP inclusion process, no further application should be needed for the project.

This modification would greatly speed and simplify the procedures involved in project initiation and implementation. Following TIP inclusion, the official resolution should double as the project application. Also, a project evaluation summary should be submitted with the original resoultion.

(2) Financial Penalities for Loss of Backing

Currently a contractual agreement exists providing that if a project

initiator backs out of a project that is underway, that party must pay all costs incurred to that point. This agreement must be invoked to prevent waste, assuming, however, that the project has not been changed by other bodies such as NJDOT during implementation.

(3) Binding Resolutions

Currently, estimates can be made of how long a given type of project will take to implement. These time estimates would be integrated in the preparation of local resolutions for project requests. The estimated time of implementation can be the key factor in a binding resolution of local concurrence. This procedure would also have to involve financial commitment by the locality. This would insure that localities would not back out at a late stage of project development. If delays cause a project to take longer to implement than had been estimated, the binding nature of the resolution would expire. Use of this procedure would provide another means to solidify local concurrence for projects.

(4) TSM-Line Item in TIP

Currently, all TSM-type improvements must go through the project advancement stage as individual projects when requiring federal funding. A possible way of removing some of the "red tape" paperwork that would otherwise be necessary would be to create a line item for TSM-type improvements in the County and State portions of the TIP. By grouping numbers of TSM projects under a "TSM line item", one federal approval

would enable the NJDOT to work on any individual project without having to get additional federal approval. NJDOT would still have to review individual projects, but the paperwork involving the federal government would be significantly reduced and the TSM process would be improved.

II. COUNTY LEVEL

A. Decision Making

(1) Increase Funding Authorization Powers

The County should be given expanded funding authorization powers for transportation projects. The County should have the right to be the recipient of federal funds for County and local road systems and should have the responsibility for allocating the funds. This change would eliminate time-consuming procedures for money to "change hands" and increase immediate responsiveness to local conditions and needs but does not necessarily eliminate the need for State approval of traffic control improvements, etc. and the need for County/State coordination.

(2) Initiate County Planning Agency Input

The County both by itself and as sponsor for the localities has no mechanism to initiate projects on state roads. The County can petition the State but cannot force any action. It is realized that this is a jurisdictional of State roads within the County network, not

much can be accomplished to force needed improvements. Therefore, some mechanism must be found to insure greater responsiveness on the part of the NJDOT to local requests. It is recommended that county agencies be given more input into the State road project implementation process. This would lead to increased efficiency and local responsiveness in policy making.

(3) Remedy TSM Data Deficiencies

To improve the current data deficiencies, it is recommended that a statewide transportation system information center be created to monitor the transportation system. This can be accomplished either by funding the County to monitor the system or by creating a state run automated system (computerized) with easy access for any user. The system should be comprehensive in scope and permanent in operation to remedy the "ad hoc", random type of data collection that is now utilized.

(4) TCC and Local-County Interaction

It is strongly recommended that the TCC continue to operate. All investigation indicates that by far, the most effective, responsive relationship exists between the County and the localities. Due to the need for local concurrence, especially in a strong home rule state such as New Jersey, this relationship is crucial because the most relevent and responsive actor in transportation policy-making and planning is the County. The relationship is a necessary one and it is urged that it be

strengthened. When inter-governmental partnerships work well, TSM goals of efficiency are aided. The local-County relationship can provide enough project background and information to enable the County to coordinate an efficient TSM combination of projects. Additionally, a strong relationship between these actors can result in fewer local concurrence problems through good communication.

B. Project Implementation

(1) TIP and TSM Prioritization

Counties should be required to prioritize their TIP items which must include TSM combinations of projects. The current UMTA provisions for this procedure are vague and unclear. A sanction system should exist so that any area which fails to prioritize their TIP and TSM packages will have delays in having any project requests considered. This provision will result in an efficient, orderly method for rational project selection for all Counties.

(2) Increase Funding Authorization Powers

See "County-Decision Making #1".

III. STATE LEVEL

A. Decision Making

(1) Add County Input into "105" Program Reduction

Currently there is no County or local input into the process by which the State "105" Program is

reduced to become the Annual Construction Program. This method leaves the most informed, responsive parties out of the decision-making process.

It is recommended that the counties be consulted before the "105" Program is reduced and that County staff with TCC input involved projects. In this manner, efficiency and local participation will be increased.

The following are some options to be considered in order for for counties and their municipalities to gain input into the State project list development process:

a. When formulating the annual element of the TIP, County TCC's would prioritize a few (approximately five) key projects for immediate advancement. It would be made clear to NJDOT (by Freeholder resolution) that endorsement by the county of the entire TIP would be conditional upon inclusion of the prioritized projects in the State "105" Program. In this fashion, both planning authority and TSM Package advancement potential could be increased for the county.

b. The NE NJ TCC could recommend procedures that would alter the current agreement whereby the NJDOT takes an initial 25% of all allocated FAUS funding earmarked for New Jersey. Due to limited matching fund capabilities, the State can only proceed with a limited number of projects. There exists the possibility that NJDOT may include a disproportionate

number of State projects in the "105" Program due to the "automatic" reservation of 25% of FAUS funding. By placing severe limits on State control of FAUS funds, Counties (and their municipalities) would have greater planning authority and greater impact from their TIP annual element designations. State latitude in "105" list development would be reduced by removing some or all of their power to reserve FAUS funds for State projects.

c. Counties through TCC deliberation could limit their TIP programming in an attempt to maintain consistency with funding realities (ie.- limited matching fund capabilities). If TIP's were underprogrammed, counties would gain control of the "105" Program development process. If programmed projects did not exceed funding realities, there would be no possibility of arbitrary State choice. All programmed projects would be able to be funded and therefore would go onto the "105" Program. This option raises questions of political feasibility but if implemented, would greatly increase the planning power of counties.

All of the above options would increase county input into the State project list development process. Additionally, TSM project combinations could be advanced in an easier, more efficient manner if county planning and project advancement abilities were expanded.

(2) Reinforce County Initiation Petitioning Ability on State Projects

See "County Decision Making #2"

(3) Remedy TSM Data Deficiencies

See "County Decision Making #3"

B. Project Implementation

(1) Simplify Action Plan Procedures

The State Action Plan for municipality initiation of project proposals should be simplified. Procedures for project initiation and project implementation should be clearly defined in a simple language with time estimates contained for each step.* The Action Plan should also be modified to encompass the aforementioned recommendation for simplifying the application procedure for projects.

(2) Improve Efficiency of Level of Action Committee Guidelines

The standards and guidelines of the Level of Action Committee must be modified to better accommodate TSM strategies and goals. The different levels of projects must be better defined in clear, concise terms. Use of words such as "significant impact" leave too much room for interpretation by the Committee and does not give clear enough guidance to project initiators.

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*A step in this direction has been taken by Middlesex County. The County has simplified the language and identified more clearly the responsibilities for municipalities. It is not in their power, however, to change processes and specific procedures. This should be the next step taken jointly by NJDOT, counties and municipalities.

TSM depends on a carefully prepared combination of projects, and implementation times must be coordinated effectively. Therefore, it should be clear in advance, what level of determination a project will receive. This is not presently the case.

Clear distinctions of language are also needed to prevent overstatement of a project's potential impact upon social, economic, and environmental conditions. Vague standards may force many projects into higher levels which delay implementation.

In addition, the guidelines of the Level of Action Committee are not compatible with the TSM concept. Projects on existing facilities may wery well have social and economic impacts but should not have to be bogged down with environmental impact statements, etc. Perhaps a new level should be created for TSM-type projects which would include public hearings but not lengthy environmental studies.

(3) Improve NJDOT Internal Coordination

Projects that have been labeled as "TSM-type" and are non-federally funded such as traffic control mesures should receive priority consideration by NJDOT. There must be greater coordination between NJDOT bureaus. The Bureau of Traffic Engineering which evaluates traffic control projects must ask the Bureau of Maintenance to implement the project on State roads.

It is recommended that the coordination between bureaus within NJDOT be improved in order to facilitate a smooth connection between project planning, approval and actual implementation to speed up the process.

It acknowledged that this improvement would be difficult within the existing organization of NJDOT, however.

(4) Creation of a TSM Liaison Within NJDOT

The problem of lack of coordination between NJDOT bureaus have been discussed. Perhaps the best solution immediately would the creation of a TSM liaison official in the DOT Commissioner's Office. This official's function would be to expedite TSM projects through NJDOT. He or she should be provided with sufficient authority to force quick communication and cooperation across bureau lines. Over a long period of time, internal reorganization within NJDOT would help achieve TSM goals.

(5) Project Application Procedures

See "Municipalities-Project Implementation 1"

(6) Remedy NJDOT Spending Problems

State funding levels should be increased to insure sufficient matching funds in the future in order to obtain federal funds from FHWA and UMTA. The need for this is evidenced by the backlog of construction projects needing local match and by the fact that inflation pushes costs higher in the long interim between application for funding and construction. Possibilities of more county and local matching funds and state transportation bond referenda should also be explored for feasibility.

IV. REGIONAL LEVEL

A. Decision Making

(1) Tri-State Regional Planning Commission Involvement

It is recommended that Tri-State continue to provide technical aid and serve as a regional clearinghouse for information. This agency should continue to monitor funding limitations for project requests and be required to review and approve projects of a regional nature.

It is further recommended however, that Tri-State should not have to be consulted for approval of non-regional, intra-county TIP projects or Federal Aid System designations.* This step is cumbersome, time consuming, and not needed as the regional planning body cannot relate efficitively to projects of a limited scope.

(2) Northeast New Jersey Transportation Coordinating Committee Involvement

As presented in the list of TSM enhancements, the relationship between NJDOT and this regional body of County representatives is favorable to the TSM process. This committee, through their powers of review over State initiated projects of regional nature serves as an excellent opportunity for local input into State and regional project implementation processes. It is, therefore, recommended that the powers of this committee be expanded to allow greater local input in these processes. The committee should act as an intermediary between State and localities for local initiated projects

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*Examples would be: A County road improvement not crossing county lines would not be a regional project whereas a transit rail station construction project would be, because the rail system serves a larger area and coordinates regional transit.

on State roads. It is felt that the committee should be given equal weight with the State and regional involved in the implementation process to allow for adequate representation of the localities.

The preceding recommendations are geared toward specific procedures and relationships that affect Middlesex County, New Jersey transportation. The following is a brief outline of recommendations that may be applied more generally to similar areas:

Decision Making Recommendations

-Require advance indications of local concurrence for projects through official documents*

-Require officials to consult with planning personal*

-Increase county input into the initiation of projects on state-run facilities*

-Create a comprehensive, computerized data collection and monitoring system for the transportation system for the area. Provide easy data access to interested users*

-Involve counties in any reduction of state projects lists due to financial constraints*

-Promote local-county relationships through a TCC-like body and link project consideration to attendance

-Increase county authority to receive and allocate federal-aid funds for county and local facilities

-Limit regional MPO involvement in project requests for federal aid to those of a regional nature

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*Recommendations directly related to improving conditions for maximum TSM combinations of projects.

Project Implementation Recommendations

-Reduce obstacles to project applications- remove multiple step application procedures and redundant requirements*

-Institute financial penalties and letters to local officials when localities abandon a project once it has been started*

-Make local resolutions binding for a period of time

-Require county prioritization of TIP and TSM project requests*

-Make State monitoring procedures more responsive to TSM strategies and conbinations, limit time consuming process (environmental studies, etc.) that may be unnecessary due to overstated impacts*

-Simplify procedures for local-state interactions; especially those for municipal initiation of projects

-Increase State transportation funding to create sufficient matching funds to obtain available federal aid*

-Explore alternative funding supplements; county and local matching funds and State bond referenda *

-Explore possibility of TSM line item contained in County TIP Annaul Element in order to reduce the volume of necessary paperwork and time

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*Recommendations directly related to improving conditions for maximum TSM combinations of projects.

F. Data Needs

I. Introduction

The concept of Transportation Systems Management is aimed at achieving maximum efficiency on existing transportation facilities with relatively low-cost, quickly implemented projects. In other words, the idea behind TSM is to identify system deficiencies and correct them as quickly as possible. By doing this consistently over the entire range of transportation services offered within a given transportation network, it is believed that "system managers" can stem the tide of ever mounting transportation problems and adequately meet growing travel demands. In order for TSM to work effectively, it must be an ongoing process with a continuous updating of information for modification of transportation systems to meet changes in demand.

The first step in an attempt to use TSM realistically, as seen throughout the report, is to identify the specific causes of system deficiencies. It is vital to catalog specific problem areas along all systems of the transportation network in order to select the applicable packages of TSM strategies. It is equally as important to compile a sufficient amount of data to effectively determine the causes of the problems and strategy packages to apply to given locations. In most regions of the Country, this is a difficult task due to the variety of jurisdictions involved on a transportation network and the multiplicity of sources within a jurisdiction that are responsible for data collection.

In this project, as the data was assembled for analysis of locations, it was discovered that the amount and type of existing data on Middlesex County's transportation systems was lacking in terms of that needed for proper analysis of most problems. Adjustments in the analysis were forced in order to cover the "gaps" in the data and in some cases additional data was collected for analysis purposes. This highlighted the fact that present efforts at data collection for the planning process are inadequate especially for the institution of TSM programs.

An important element of TSM is monitoring system efficiency to determine the impacts of various strategy packages. To incorporate this element into a well-integrated TSM program it is essential for each region to determine the Measures of Effectiveness (MOE'S) which best characterize their network. Using an adequate data base, the "system managers" can monitor implementation of TSM strategies and determine their impact by the prescribed MOE'S for that region. It is very important to stress here that the working of TSM is to be regarded as an ongoing program and that its desired impact on travel behavior and on the efficient use of the transportation systems, is achieved through an incremental process which is continuously refined. This can only be accomplished through the implementation, monitoring, evaluation and adjustment of a TSM program, which combines more traditional approaches to capacity improvements with efforts to increase vehicle occupancy on the highway, in transit and paratransit modes, as well as instituting other demand management techniques when appropriate. A program of this scope offers the most promising opportunity for achieving system efficiency and related TSM objectives.

In order to establish a workable TSM program it is necessary to have an adequate data base. It is recommended, therefore, that any area, interested in undertaking a comprehensive TSM program, conduct a preliminary analysis to identify not only operational systems deficiencies but also data collection system can be developed. The approach recommended here involves the use of a centralized data collection agency funded to develop a consistent, comprehensive and accessible source of transportation systems data. Since the county governments are active in transportation planning and are close to the network and local users, they make ideal candidates for such a rule. However, due to budgetary constraints and mechanisms already in place, it may be more realistic to set up such an agency at the State level. As part of the State Department of Transportation, the agency could operate a state-wide data collection system, preferably computerized to allow for easy user access, and make the information available to all interested parties on a regular basis and as needed for special analysis.

Once the data and system deficiencies have been identified, a viable TSM program can be established to effect improvements on the network. The following lists are comprised of those recommended basic data requirements and measures of effectiveness, which have been found to be minimally necessary for the initiation of a working TSM program (for a more detailed description of the MOE's and suggested methods of data collection see Chapter 9 of this report, "Monitoring Guidelines"):

Basic Data Requirements-Highways

Traffic Volumes:	A.A.D.T.'s
Accidents:	Number, type and location
Travel time and delay:	Along entire network and at every signalized intersection
Intersection Vehicle Turning Movements:	At all key intersections
Vehicle Occupancy:	Along entire network
Vehicle Miles of Travel:	Along entire network
Parking Inventory:	Including supply, accumulation, cost, ect.
Vehicle Classification:	Determine patterns of vehicle usage along entire network
Peak Hour Characteristics:	Determine previous traffic patterns in peak period at key locations along network
Trip Distribution:	How are trips distributed over network
Trip Generation:	Where are generators located, how much traffic do they generate what peak periods
General Traffic Engineering:	Designed subareas for detailed study, allows for system extrapolation.

Measure of Effectiveness-Highway

Vehicle Delay:	Shows improved system efficiency
Vehicle Stops:	Exhibits reduction in energy consumption

Accident Rate:	Compares safety and efficiency of improvements
Number of Car and Van Pools:	Shows impact on V.M.T. and P.M.T.
Person Miles of Travel:	Indicates efficency and use of H.O.V.'s
Level of Service:	Exhibits increased capacity and/or reduces demand
Volume/Capacity Ratio:	Comparison of demand vs. supply
Length of queue:	Measures delay at and efficiency of inter-sections
Noise Levels:	Environmental measure of efficiency and effectiveness
Energy Consumption:	Environmental meausre of efficiency and effectiveness
Air Quality:	Environmental measure of efficiency and effectiveness
Person Hours of Travel:	Measure of system carrying capacity and efficiency.

Basic Data Requirements-Transit

Operating and Maintenance Cost:	For all transit operators region
Operating Cost/ Revenue Vehicle Miles:	For all transit operators region
Operating Revenue:	For all transit operators region
Total Transit Passengers:	For all transit operators region
Revenue hours of operation:	For all transit operators region
Average trip length:	Along entire network
System Inventory:	Determination of existing transit network

Measures of Effectiveness-Transit

Disadvantaged Ridership:	Measure of efficient system
Dependability of Service include: -frequency of transit service -hours of operation -schedule adherence	Shows reliability of mode
Transit Transfer time:	Indicated inter-line coordination measures delay
Tranist load factor:	Measure of access and demand
Passenger/revenue vehicle mile:	Measure of efficient system

Basic Data Requirements-Demand

Origin and Destination of Workers:	Target areas for demand strategies
Starting and quiting time of industries:	Target areas for demand strategies
Parking supply and demand:	In areas adjacent to trip generations
Vehicle Occupancy:	Entering target areas
Computer matching program:	Available to all interested users.
Employment:	Within target areas.

Measures of Effectiveness-Demand

Number of car and vanpools:	Indicates acceptability of idea and shows impact on V.M.T. and P.M.T.
Persons hours of travel:	Measures system carrying capacity and efficiency
Person miles of travel:	Measures system efficiency and of HOV's
Energy Consumption:	Measures system efficiency and of HOV's
Congestion and delay at key approaches to target area:	Determines impact of demand strategies
Air Quality:	Determines impact of demand strategies
Noise Levels:	Determines impact of demand strategies

G. Study Organization

I. Introduction

Middlesex County's prototype study exhibits the potential of TSM as a fast and efficient method of identifying problems and quickly initiating improvements. The study was very useful in pinpointing not only physical problems on the local transportation system but also procedural and institutional problems associated with the transportation planning process. The result of the study can be very fruitful if recommendations are acted upon judiciously. The application of TSM strategy packages and the procedural improvements outlines, when consideration together with the present economic situation show great potential for TSM as the planning process of the future.

This section of the chapter gives findings and recommendations outlining a basis for a comprehensive on-going TSM Program.

The approach of this study to TSM emphasize the use of existing data for expedient and effective manpower utilization. Although it was found that present data levels are insufficient to develop a comprehensive TSM program, it was possible to identify both system and data deficiencies. It was only in the analysis of the problems and solutions that the original study focus had to be changed slightly. Due to the lack of adequate data sources there developed a heavy reliance on the judgement and experience of the consultants employed in combination with that of other study participants including local, County and State technical staffs. This emphasized the need for improved data collection and storage procedures.

The TSM prototype study also emphasized the active use of public participation. The work "active" is stressed becuase, as seen throughout this report, the process used went beyond merely opening all study meetings to the public as a token gesture. On the contrary, "special efforts" were made to get extensive input from a variety of public sources. This input was found to be invaluable to the successful outcome of the study. Beginning with the convening of the TSM Steering Committee and continuing throughout the Chambers of Commerce and general public meetings, the calibre and usefulness of the public input was excellent. The value of this type of input was accentuated by the data deficiencies discussed earlier, thus making this source of information even more important.

Once the analysis of the public and professional input began, no suggested strategy of identified problem area was excluded from consideration with even some capital intensive projects begin included. It was found that in some cases a capital project in combination with a package of lower cost strategies would be necessary to maximize the efficiency of the system. It was decided that the approach taken would be to examine all possible combinations of strategies for certain types of problems and attempt to obtain the maximum impact within the parameters governing the given situation.

Since the overall goal of the study was to implement improvements on the transportation system, there had to be a focus on another important area of concern. Examined in depth was the project implementation process and the intergovernmental relations that affect the process. It was found that it requires a coordinated and cooperative effort on all levels of government to improve procedures for the fast implementation process and the intergovernmental relations that affect the process. It was found that it requires a coordinated and cooperative effort on all levels of government procedures for the fast implementation of a TSM program. It was also found that inter-departmental cooperation within levels of government is as important as the cooperation between levels of government. The effort put forth in this study was a combined product of the County Office of Engineering and County Planning Board. This kind of inter-office joint effort is an important element of a successful TSM study. It is hoped that the recommendations made on inter-governmental relations can foster this kind of cooperation at other levels of governmnet as well as between them. It is further hoped that some improvements can be made in the implementation process. Together, improvements in both of these areas will help create a favorable climate in which TSM programs can flourish.

A final major finding of this study was the choice of study area. It was found that perhaps one major corridor and one minor corridor was a little too much to manage in an initial TSM study. The area of study should be chosen based upon manpower, data resources and time constraints, to avoid an overburdening project.

The TSM concept holds significant promise in the area studied to improve system efficiency, but certain improvements must be made to develop the concept into a complete program. In order to do so, the following approach is recommended:

First, data deficiencies must be identified within the given study area. This will determine the course of action of the preliminary TSM study and begin the process of ongoing system monitoring. It is important to develop this monitoring program as a prelude to a permanent TSM program.

Second, early public participation is essential to the success of TSM. Some sort of citizen steering committee is a good first step in that direction. Local government, public institutions and private industry, as well as the general public should all have some input into the study and eventual TSM process.

Third, the important area of intergovernmental relations should be investigated for deficiencies. These relations should be examined in depth to determine improvements needed. The steering committee appears to be a good mechanism to foster better relations between levels of government, if proper representation of all transportation planning participants is obtained. In conjunction with improved intergovernmental relations, improvements must be made in the general project implementation program. In this vein it is recommended that federal and State procedures be streamlined to allow the quicker flow-through of non-local funds needed to help improve the transportation system. This is the single most frustrating "log-jam" for project implementation. If the federal government is serious about TSM programs, some commitment should be made on the part of UMTA and FHWA to aid the processing of TSM strategy packages.

Finally, it appears that the County level of government represents a most logical TSM coordinator. Typically, technical expertise and manpower is readily available on this level. Counties are closer to the systems and/or actors than many regional agencies. Transportation planning efforts at various levels tend to be integrated at their level thus allowing for better integration of TSM into the long range planning process. Counties can also save as intermediary between local governments and higher levels of authority.

In summary, TSM can be an excellent opportunity to improve system efficiency provided some changes are made in present procedures and relationships. In anticipation of these much needed changes Middlesex County proposes a three-step process to institute an active TSM program:

Step 1: Initiate a preliminary TSM study which incorporates the development of an implementation plan within a 12-18 month period, using existing data and identifying present data deficiencies.

Step 2: Implement all projects that are ready from preliminary study, gather additional data needed for other identified projects.

Step 3: Analyze further those projects that require greater in-depth analysis and develop on-going monitoring systems.

CHAPTER 11: THE FUTURE OF TSM

A. TSM IN MIDDLESEX COUNTY

Middlesex County's Transportation Systems Management Planning Prototype Study was very successful in exhibiting the potential of TSM as a planning tool. The County was able to pinpoint problem areas and practical "low-cost" solution alternatives on the transportation systems using the TSM process. It was also able to identify the institutional interaction necessary to improve the now inefficient implementation process. This was a vital by-product of the study effort, because without proficient and timely implementation TSM is ineffectual.

TSM emphasizes the "speedy" implementation of relatively low cost improvements designed to produce more efficient use of existing transportation systems. Using the systems more efficiently means moving more people and more goods on existing facilities. As the Middlesex County experience has determined, this can only be done through the implementation, monitoring, evaluation and continued adjustment of a TSM program, which stresses capacity improvements wherever possible as well as demand management strategies. TSM should be regarded as an on-going program, whose desired impact on travel behavior and system efficiency is achieved through an incremental process, being continuously refined to achieve the desired goals. There should be no area of transportation left unconsidered, no project or strategy left unanlayzed. The program must identify the best combination of all types of projects with maximum participation by those people, who will be impacted. The program must also outline a cooperative and coordinated implementation plan involving all relevant transportation actors, necessary for expedient action.

If the TSM program outlined above can be intergrated into the operational management of transportation facilities on a system-wide basis, then TSM truly holds great potential for the future of transportation planning in Middlesex County. In fact, the conclusion has been reached that TSM holds significant promise in this area to improve system efficiency and should be combined into an ongoing systematic transportation monitoring and improvement program, county-wide. In order to accomplish this, the County must integrate TSM into the long-range planning process as a continuous systems assessment program which includes incremental system improvements. Public participation in all phases of an integrated TSM program will be an essential ingredient to the successful institution of the program and to the implementation of projects. The County TSM experience has also demonstrated the need for im-

proved and active interrelations among all levels of governments as well as with local citizens and private industry, who are directly impacted by the results of TSM work.

Middlesex County is presently gearing-up for the efforts necessary to implement the TSM study recommendations. Additional UMTA Section 9 (now Section 8) funds will be used to monitor the impact of the selected TSM strategies as they are implemented. Based on the preliminary results from this study, it is felt that TSM appears to provide a viable framework within which to approach transportation problems in a timely, comprehensive and effective manner. It holds the most promise of achieving the desired goals of system efficiency and environmental quality. Middlesex County will be committing its transportation planning and engineering resources towards the successful completion of its responsibilities, as outlined in the TSM implementation plan. This is being done in an attempt to continue to assess a concept that is hoped will be the answer to present transportation problems and future community needs.

B: TSM Nationwide

This investigation of TSM as a transportation planning mechanism, although not yet providing conclusive proof, does provide a firm basis from which speculation can be made about the future of TSM nationwide. The TSM requirements appear to provide a viable framework within which to approach transportation problems in a comprehensive, coordinated and effective manner in a relatively short amount of time. This statement is made in view of the fact that this nation still faces a myriad of transportation problems which have not been solved by the traditional "capital intensive" improvements approach. Furthermore, TSM-type projects have been applied in an "uncoordinated" fashion, nationwide through TOPICS and other such programs with some degree of success. The major problem thus far has been to find a format for the application of a coordinated and comprehensive TSM program for the nation. This is one area in which it is felt that conclusions can be drawn based upon the Middlesex County experience. The TSM approach used by Middlesex County has the potential for nationwide application. This conclusion is based upon the following facts: a) the multitude of transportation facilities and problems existing in this County; b) the diversity of land uses existing along the travel corridors and; c) the multiple levels of government involved in transportation improvements. These conditions combined to make Middlesex County an ideal laboratory for testing the TSM concept for nationwide application.

As a result of our prototype study project it has been recommended that TSM programs be initiated at the County level

of government. Counties are closer to the transportation systems than higher levels of government. They may already be coordinating planning activities on the subregional level and therefore, work closely with local system users in problem identification and solution. The counties may also be better equipped than local governments to handle such a coordinated and comprehensive program. They may also have the manpower not available to many local governments. In areas of the country where these conditions exist, TSM can best be implemented as a planning mechanism on the county level of government.

As recommended earlier in the report (see Chapter 10, Section 6 - Study Organization) Middlesex County's TSM approach can be translated into a three-step process for wider application.

Step 1: Initiate preliminary TSM study.

Step 2: Follow-up on implementation plan.

Step 3: Greater in-depth analysis and development of monitoring system with continuous incremental improvements.

Three important elements of the initial study, which are essential to the successful institution of an on-going TSM Program are the inclusion of public participation, proper problem identification and the investigation of institutional relationships. First of all, a heavy emphasis on public participation is necessary for successful implementation of comprehensive TSM program. Involvement of the system users in the planning process makes sense and fulfills Federal "3C" requirements. Secondly, the inclusion of any and all identified problem areas and suggested solution at all leveles of input insures proper considerations of all possible alternatives, including capital intensive projects, where appropriate. This also aids in gaining acceptance of final recommendations if shown to be the best alternative. Finally, the investigation of institutional relationships and implementation procedures can reveal hindrances to the initiation of a TSM program with resulting recommendations for needed changes. As stated previously, without proficient and timely implementation TSM is ineffectual. Institutional relationships must work well in order to insure the scheduled implementation of TSM projects.

In closing, a word must be said about the Federal Government's role in TSM. The recommendations of this report identify problems associated with project implementation on all levels of government. The Federal Governement, however, is the controlling force on most transportation funding and only the Federal

Government can make the procedural changes necessary to allow TSM programs to function. Federal and state funding procedures must be streamlined to allow quicker flow through of much needed federal funds to help improve transportation systems quickly. Federal agencies must cooperated in the expedient processing TSM strategy packages. Federal cooperation and coordination are vital to the success of TSM nationwide.

APPENDIX A

CORRIDOR LOCATIONS AND MAPS

The following Corridors were selected by the staff as recommended study areas in the listed categories due to their multiplicity of problems*and their importance to the overall county transportation system:

I. Major Corridors

-U.S. Route 9
-U.S. Route 1/ N.J. Route 27
-N.J. Route 18

IIa. Minor Corridors

-Plainfield Avenue
-Oak Tree Road
-Wood Avenue
-Roosevelt Avenue
-Woodbridge Avenue
-Parsonage Road
-Milltown Road
-New Brunswick Avenue
-Route 522
-Cranbury/Plainsboro Road
-Landings Lane/River Road/Metlars Lane
-Hows Lane/Jersey Avenue/Livingston Avenue
-Park Avenue/Plainfield Road

IIb. Urban Areas

-New Brunswick
-Carteret
-Perth Amboy
-Woodbridge
-South River
-Highland Park

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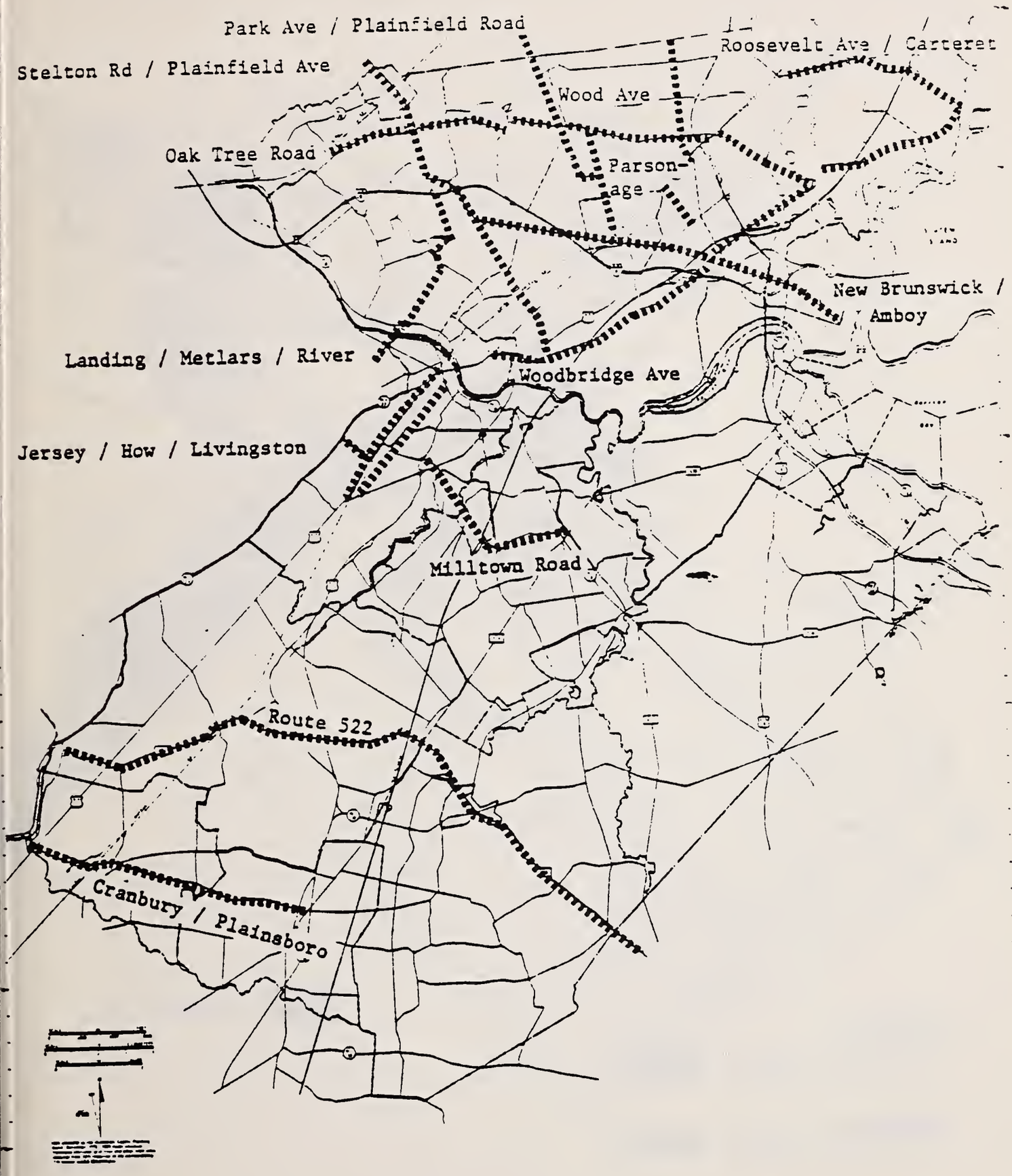
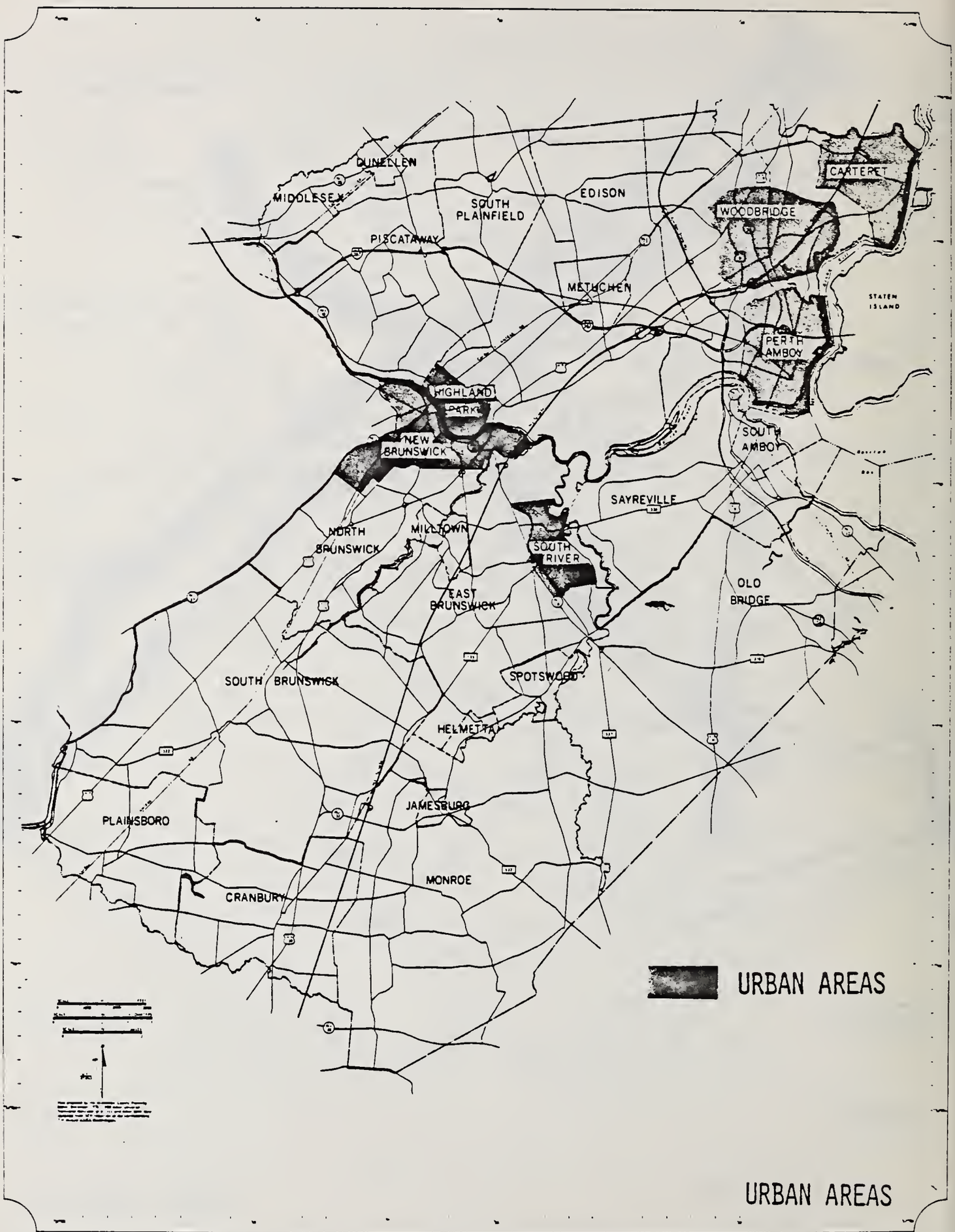
*See enclosed TOPICS Maps for illustrations of problem areas.

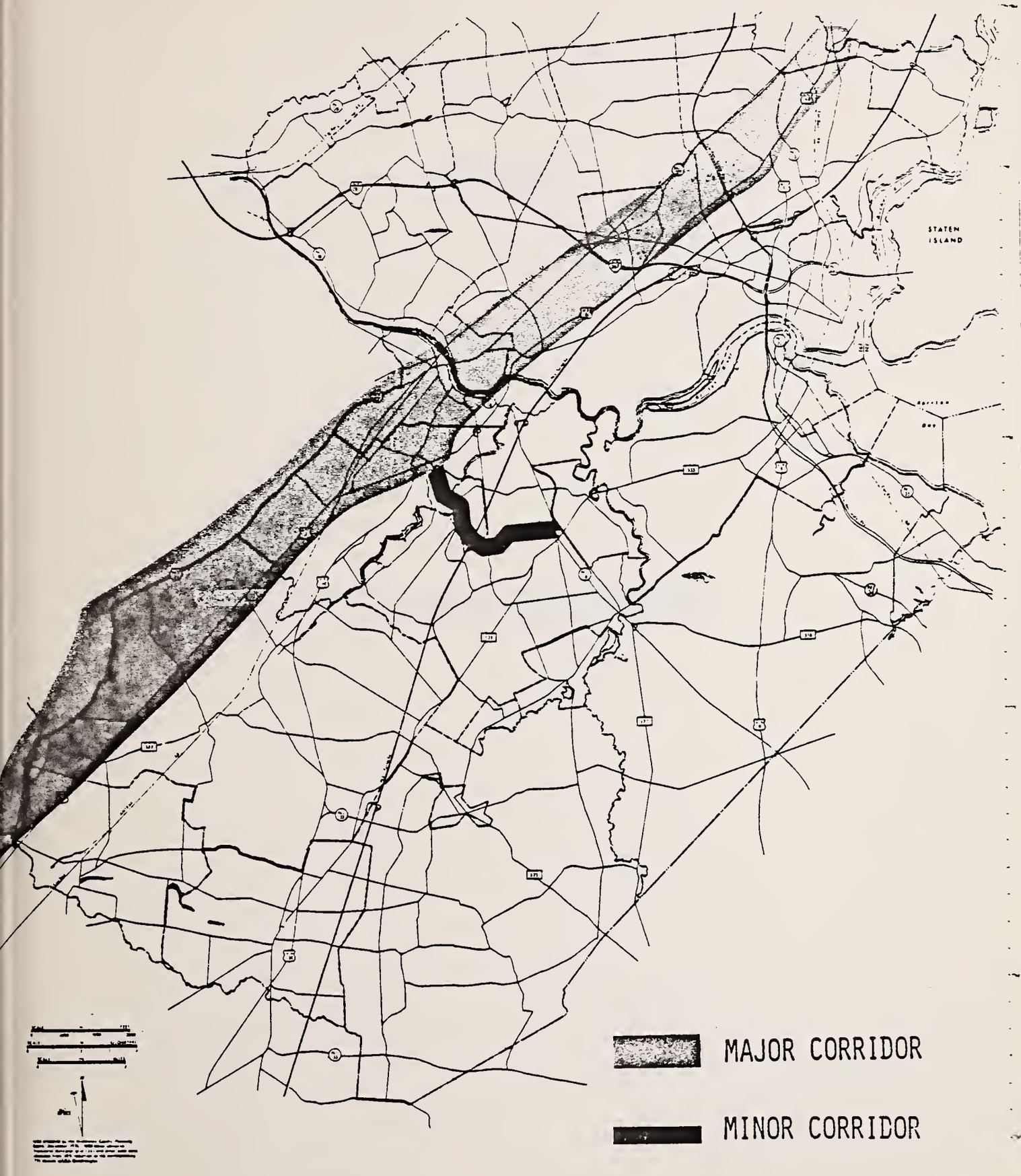
MAJOR CORRIDORS



MINOR CORRIDORS


DUNELLEN
MIDDLESEX
SOUTH PLAINFIELD
EDISON
CARTERET
WOODBRIDGE
PISCATAWAY
METUCHEN
STATEN ISLAND
PERTH AMBOY
HIGHLAND PARK
NEW BRUNSWICK
SOUTH AMBOY
SAYREVILLE
NORTH BRUNSWICK
MILLTOWN
SOUTH RIVER
EAST BRUNSWICK
OLD BRIDGE
SOUTH BRUNSWICK
SPOTSWOOD
HELMETTA
JAMESBURG
PLAINSBORO
MONROE
CRANBURY
URBAN AREAS

URBAN AREAS



SELECTED TSM STUDY AREAS

APPENDIX B

FINAL SELECTED TSM STRATEGIES

TRANSPORTATION SYSTEMS MANAGEMENT IMPLEMENTATION DEMONSTRATION

COUNTY OF MIDDLESEX, N. J.

Y TO
DDESEX COUNTY PLANNING BOARD
0 Livingston Avenue
lew Brunswick, N.J. 08901
201) 246-6275

FINAL SELECTED
TRANSPORTATION SYSTEMS MANAGEMENT (TSM) STRATEGIES
FOR ROUTE 1 AND 27
AND MILLTOWN ROAD IN NORTH BRUNSWICK, EAST BRUNSWICK, MILLTOWN AND SOUTH RIVER

KEY:

R - Recommended Strategy By Consultant

RA - Strategy Recommended For Further Analysis By Consultant

SECTION A

ROUTE 1

PHASE I	PHASE II	PHASE III	PHASE IV
IMPLEMENTATION POTENTIAL	IMPLEMENTATION POTENTIAL	IMPLEMENTATION POTENTIAL	IMPLEMENTATION POTENTIAL
6 - 18 MONTHS	12 - 30 MONTHS	24 - 36 MONTHS	36 MONTH INITIAL CONST. 36+ MONTH COMPLETION
R - install variable speed control signs to indicate signal timing progression	Increase Capacity on Route 1 Along Entire Length of Section A RA - improve highway lighting		R - resurface roadway, improve drainage
R - more advanced warning of exits and intersecting roadways			R - additional lane in each direction making Route 1,6 lanes
R - better lane control for exiting and turning movement			

Route 9 Merge

R - the merge point between Route 1 and Route 2 should be lengthened to allow smoother and safer transition of traffic flow-some sort of accel/decel lanes, should be provided *

* In conjunction with other physical improvements only

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Garden State Parkway - DOT *			
R - better signing to get vehicles properly routed	R - signalize intersection of GSP ramps with Route 27 (traffic acutated signals would be more effective)		RA - new exit ramps onto Route 1 north from GSP south bound RA - south bound entrance from south bound Route 1 RA - improved access/egress between Route 27 and GSP RA - north bound access to GSP from Metropark

* Special situation recommendation for further study: access and egress ramps to the Parkway within the corridor should be reviewed for deficiencies

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Parsonage Road/Menlo Park *			
RA - improve mass transit service to Mall-promote use to reduce congestion RA - establish park & ride in Mall to reduce corridor congestion			RA - overpass from Parsonage Road (necessary but cost prohibitive)

* Special problem area (separate analysis)

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Grandview Avenue		
			RA - widen jughandle to increase capacity R - improve channelization on intersection approaches to reduce conflict points RA - widen approaches
	Woodbridge Center		
RA - develop park/ride facilities to reduce congestion RA - develop mass transit service to centers R - improve signing for lane control			

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Green Street Circle	R - Route 130 type improvement cut through circle and install signalized intersection at center (interconnecting to Route 1 system)	
	Ford Avenue		
	R - geometric improvements to facilitate smoother access/egress onto & from Route 1. Flare out intersection or right lane accel/decel.*		

* Widening of the Route 1 approaches by resurfacing the shoulder.

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Route 287 Interchange		
R - improved signing & striping in weaving area	RA - ramp metering on south bound exit onto north bound exit onto south bound Route 1.		RA - cost prohibitive-widen ramps additional lane.

Section A
Route 27

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Increase Capacity		
R - ban parking on 27 at least during peaks			RA - resurfacing & drainage improvements, curbing
R - interconnect signals			
R - directional progression in peak			
R - intersection ahead warning signs (poor sight distance)			
R - lane control signing for turning movement			
R - lane striping to delininate roadway			

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Route 35 Intersection		
R - legislate Leesville Avenue as a one way street away from Route 27 In conjunction with the above: R - retiming signal to give north bound 35 a lead or lag phase	R - traffic island - left turn lanes needed from Route 35 onto Route 27.		

Phase I	Phase II	Phase III	Phase IV
Implementation Potential	Implementation Potential	Implementation Potential	Implementation Potential
6 - 18 Months	12 - 30 Months	24 - 36 Months	36 Month initial const. 36+ Month Completion

Green Street

(Problem: traffic entering Green Street from side streets causes flow impedence). Suggested solution:

R - legislate directional change make Middlesex-Essex Turnpike one way away from 27 for one (1) block

R - signalize Middlesex - Essex, Green Street intersections to coordinate the signals to prevent a spill-back (more cost-efficient than one-way rec. at left)

R - flare out intersection to improve interchange with turning lanes

R - left turn lane from west bound Green Street

R - left turn lane from south bound Route 27 (only with signal improvement - lag green south bound)

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Wood Avenue Underpass		(Street Project) R - widen approaches for increased capacity R - widen underpass

Phase I

Implementation Potential
6 - 18 Months

R - retiming signals at Middlesex, Lake & Central, possibly to four (4) phases

R - ban all left turns at Lake & Essex (alt. to signal)

R - retime signal at Bridge Street & Route 27 to three (3) phases

Phase II

Implementation Potential
12 - 30 Months

Metuchen "dog-leg"

R - signalize New Street & Lake

R - flare out intersection of New & Lake for turning lnaes

R - ban left turns from Lake to New Street

R - retiming signal at Amboy & Lake to three (3) phase signalization

R - flare out Amboy intersection for turning lanes

R - signalize Essex & Lake

R - flare out intersection for turning lanes

Phase III

Implementation Potential
24 - 36 Months

Phase IV

Implementation Potential
36 Month initial const.
36+ Month Completion

RA - realign Route 27 to remove "dog-leg" (project listed on TIP has local support)

RA - widen all four(4) rail road underpasses (in conjunction with Phase II improvements)

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Correja Avenue		
R - ban all left turns	R - improve sight distance at intersection - remove obstruction from corners		
	Magnolia Road & Willow Avenue		
R - ban all left turns (after Wood Avenue reconstruction)	R - signalize intersection (as alt. to traffic control strategies at left)		
R - make Willow Avenue one way away from intersection			
R - make Magnolia Road one way away from intersection (political feasibility question)			

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Dellwood Avenue		
R - restrict parking on approaches to intersection	R - improve corner radii to facilitate turning movement *		
RA - restrict driveway access near intersection	R - improve sight distance-setting out proper sight triangle		

* With other physical improvements only

Evergreen Road

R - improve turning radii at corners *

R - recommend signal with turning phase in signalization

R - flare out intersection for turning lanes

* With other physical improvements only

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION
Parsonage Road			
RA - restrict driveway access onto roadway RA - recommend retiming signal to four (4) phase with lead lag R - improve striping & signing for lane control (channelization)		R - improve intersection geometry to facilitate flow; off angle approaches	
Metropark: Special Problem Area (Separate Analysis)			
R - suggested staggered hours and/or flex time to Metropark Industries R - introduce van and car pooling R - interconnect side street signals for improved flow	RA - improve access to park/ride facility	RA - expand parking where feasible	

Section B
Route 1

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
R - lane control for more efficient existing			
RA - stricter control on advertising that interferes with traffic control			RA - shoulder lanes needed
RA - restrict driveway access to roadway			R - remove roadside hazards
Old Post Road/Plainfield Avenue			
R - three (3) phase signal operation		RA - resurface roadway	R - increase capacity in jughandle
Melville Road			
		RA - eliminate intersection with Route 1 un-necessary signal, causes excessive disruption in flow	

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Woodbridge Avenue		
		R - widen exits to facilitate flow off of Route 1	
	Bonhampton Rail Road Crossing		
	RA - inefficient actuation of signal causes unnecessary delays on Route 1 better actuation needed		R - turnout lanes needed for buses and trucks to stop at crossing without disrupting traffic flow
	R - replace crossing pavement		

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Talmadge Road & Sutton/Kilmer Park & Raritan Industrial Center*			
R - coordinate industries along these roads to stagger hours between companies that need access to road	R - provide improved pedestrian access (no sidewalks exist along Talmadge Road)		
R - coordinate goods deliveries & pickups in off-peak			
RA - provide mass transit service into areas			
R - encourage van and car pooling introduce Federal progams to companies			

* Special problem area, special analysis

Section B
Route 27

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Increase Capacity on Route 27			
R - coordinate goods movement in off-peak			RA - widen road to include 6-8 feet shoulder lane
RA - driveway access control needed to reduce conglict			RA - new catch basins improve spot drainage problem
R - recommend staggered hours to large industries adjacent to Route 27 in this area *			
R - introduce van and car pooling possibilities private industry there also			
R - interconnect 27 signal			
R - directional signs to industries and intersection			
R - lane control and channelization with pavement markings			

* Staggered hours are possible in two ways: within large companies of 1,000 or more employees or between smaller industries within close proximity to several other industries using the same system.

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Talmadge Road		
R - possible three (3) phase signal	R - geometric improvement; flare out intersection to include turning lanes		RA - widen roadway for increased capacity
	Plainfield Avenue		
RA - stricter driveway access control into intersection approach is needed	RA - demand actuated signalization		
R - restripe intersections to facilitate left turns			
R - limit left turn movements during peak			

SECTION C
ROUTE 1

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION
Increase Capacity on Route 1			
RA - stricter control of driveway onto Route 1 R - improve lane control for exit approaches R - more advance warning on exit approaches			
RA - better access control needed for development at interchange	R - improve accel/decel lanes on north bound Route 1*		RA - increase capacity of Weston's Mill Bridge
* With other physical improvements only			
Ryder's Lane Overpass			
	R - lengthened accel/decel lanes needed at interchange with Route 1 *		RA - widen Ryder's lane to increase capacity
* With other physical improvements only			

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION

Sears & Roebuck Company

RA - northern most access driveway of Sears is within Route 1 accel lane; should close this driveway & open access further south on Route 1

R - sight distance at Sear's entrances need to be improved for safer & smoother access onto Route 1

Squibbs

R - recommend staggered hours to company

R - introduce Federal van & car pooling programs

New Brunswick Shopping Center

limit access/egress by means of driveways within Milltown Road weave area

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
		South of Route 130	
		R - resurface roadway	RA - improve drainage
		ConRail Overpass	
		R - resurface roadway	RA - widen overpass to increase capacity

Section C
Route 27

Phase I
Implementation Potential
6 - 18 Months

R - ban parking on Route 27 seek to replace with off-street parking

R - institute no stopping or standing in peak periods

RA - stricter control of access onto Route 27 is needed

R - interconnect signals on Route 27

R - better lane control for easier access/ egress

R - directional signing to properly routing vehicles

R - goods movement in off-peak

Phase II
Implementation Potential
12 - 30 Months

Increase Capacity on Route 27

R - improve pedestrian mobility

RA - actuated control - demand responsive

Phase III
Implementation Potential
24 - 36 Months

Phase IV
Implementation Potential
36 Month initial const.
36+ Month Completion

RA - reconstruct roadway down to sub-structure

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION
	Albany Street Bridge *		RA - resurfacing bridge-improve drainage RA - new bridge deck-widen bridge

* Special recommendation: push for completion of Route 18 project

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Easton Avenue

R - ban parking in peak

R - ban left turns in peak

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION
New Brunswick CBD			
RA - recommend auto - free zone from George Street from New Street to Albany Street R - limit truck deliveries to off-peak RA - possible jitney loop bus service for CBD RA - develop better mass transit service	R - improve pedestrian access from 5th ward into development area- part of overall improvement program for New Brunswick CBD- tree lined pedestrian walkways, street lighting, etc. RA - develop peripheral parking with access to major roadway		
Albany Street - entire length			
R - ban parking in peak			RA - reconstruct roadway in sections

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Route 18 Construction			
RA - recommend park/ride on New Brunswick periphery with shuttle bus service into town R - encourage car & van pooling, staggered hours etc.			
River Road			
R - improved turning phases of signal R - improve lane control over bridge and on Raritan Avenue & River Road approaches			
Joyce Kilmer, Louis/Suydam Street			
R - three (3) phase signalization R - ban parking in peak			

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Jersey Avenue		
R - improve signing & striping for lane use control R - ban parking during peaks	R - improve intersection geometrics flaring out intersection to include turning lanes- left turn lanes from 27 onto Jersey		
	Franklin Blvd.		
	R - improve turning radii to facilitate safe & efficient exiting of traffic *		
* With other physical improvements only			
	Penn Central Rail Road Crossing		
R - improved signing	R - new signal lights		R - new paving section needed

Section D
Route 1

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Increase Capacity on Route 1			
R - more advance warning for intersections	R - actuation: demand esponsive	R - resurfacing roadway RA- widen roadway on steepgrades for truck passing lanes	RA - drainage improvement R - widen existing lanes a couple of feet to improve quality of flow
Route 522			
R - improve signing and pavement striping at intersection - identify turning movements; county road signs			RA - widen roadway (expensive?)
New Road			
R - redesign approaches widen out for turning lanes proper signs & striping			RA - widen New Road (expensive?)

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Adam's Lane/Cozzen's Lane			
R - signal timing R - better signing & striping for lane control & directional guidance	R - geometrics - turning radius of Cozzen's Lane jug *		RA - widen Adam's Lane East approach 1 lane
* With other physical improvements only			
Penn Central Rail Road Crossing			
R - improved turning lanes for trucks & buses to stop at tracks without disrupting flow - better signing and striping R - proper rail road crossing signs & signals	R - repave crossing (prefab crossing material)		

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Forrestal Complex			
RA - access onto Route 1 from complex should be designed for minimal conflict with traffic flow		R - accel/decel lanes will be needed for smooth and safe transition of increased traffic flow complex	
Plainsboro Road			
R - warning signs and/or signals needed for approach to intersection due to poor sight distance			R - widen jughandle to two (2) lanes to increase capacity

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Section D			
Route 27			
Increase Capacity of Route 27			
R - advance warning of intersection where poor sight distance exists R - properly identify county roads		RA - resurfacing and drainage improvement; replace drainage ditch on side road with proper catch basins, etc. R - develop turn out lanes for bus stops to improve quality of flow	RA - widen roadway to four (4) lanes R - remove dangerous roadside hazards; utility poles too close to road for such high operating speeds - drainage ditch also too close - no shoulder
Burnet's Lane, Cozzen's Lane, Finnegan's Lane			
	R - flare out intersection for turning lanes, left turn off 27		

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion

Shop-Rite in Franklin

R - left hand turning lane needed on north bound 27

RA - access to and from Shop-Rite on 27 needs to be reviewed and curtailed: needs more detailed analysis

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How Lane

R - three (3) phase turning signalization

R - lane use control by signing and striping

R - widening to provide turning lanes - left turn from 27

Ridge Road

R - improve geometrics of intersection for smooth transition of traffic flow

R - provide turning lanes

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Route 518		
	R - geometric and safety improvements needed due to angled approaches to intersection (check with DOT)		
	Raymond Road		
		R - improved intersection alignment with Route 27 channelization of traffic with traffic island, striping	

Corridor-wide Problems

Problem I

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Inconsistent Transit System			
R - develop better marketing for existing services	R - develop uniform schedule format: County will print schedules for all local buses in same format		
RA - develop uniform fare rates and easy transfer system	R - publish annually updated transit guide for entire County		
R - identify additional locations for bus stops and shelters where needed, secure funding: Shelters on Route 27 in North Brunswick and Highland Park; legal bus stop with signs throughout corridor	R - encourage mass media to keep public informed of developments and changes in transit: develop transit marketing ads for newspapers		
	R - erect bus shelters, standard bus stops signs and schedule display cases to encourage mass transit use: put schedules of all lines serving shelters in the schedule holders. Information phone numbers and route names on each bus sign		
	R - develop mass transit information telephone center		

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion

Rerouting transit lines to be more demand responsive

RA - identify transit lines that run close to large industrial office complexes which can be rerouted to service these complexes (See page A)

RA - design routing and schedules to best service these areas (See page A)

R - identify other activity centers which lack transit access and any transit routes nearby (See page B)

RA - reroute these lines in the off-peak to allow greater access to these centers (See page B)

R - publicize any such activity to encourage use

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion

Poor Interface Between Mass Transit Modes

RA - develop bus feeder service to train stations: encourage use lines as feeders (See page C)

R - determine schedule changes necessary to allow coordination

RA - work out most efficient inter-change

market the change

RA - develop joint rail-bus ticketing and pricing scheme

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Disrepear of Railroad Stations			
R - coordinate with DOT and Conrail for best maintenance of stations that is possible	R - improve railroad stations to encourage use; fix up New Brunswick and Metuchen stations for example	RA - expand lot at Metropark (build garage); enlarge existing Park & Ride where feasible	RA - reconstruct railroad facility at build lots at Edison
RA - develop park/ride facilities where feasible			
R - market park/ride: promote Metuchen lot better			
R - study inadequacies in existing system			
RA - establish new routes where necessary to serve demand; investigate new bus route from North Edison to Woodbridge and Menlo Park Malls and Perth Amboy or Metuchen			
RA - develop monthly or weekly pass system to encourage ridership			

Corridor-wide Problems
Problem II

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion

Trucks Decreasing Capacity of Roadways in Corridors During Peak Periods *

Requires Detailed Analysis *

R -coordinate scheduling of goods delivery and/or pickup in off-peak hours

RA -encourage truck use of Turnpike with modified pricing schemes *

R -develop rational system of truck routes to curtail conflicts within overall system

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* Special Recommendation

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion

Truck Traffic on Local Streets

RA - strict enforcement of truck route ordinances once a rational system is established

RA - encourage use of higher capacity roadways

Corridor-wide Problems
Problem III

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Employee Acess Problem			
R - van pooling programs RA - coordinate special bus service to hospitals within same routing system (JFK & Roosevelt Hospitals for example) (See previous comments) R - car pooling for hospital staff R - rescheduling of shifts to avoid congestion			
Visitor Access			
R - need better mass transit service particularly to inner city hospitals (Middlesex General, Saint Peter's, etc.) promote better use of existing bus lines	R - introduce a paratransit service for elderly and handicapped where needed		

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
JFK Roosevelt Hospital on Parsonage Road, Emergency Vehicle Access			
	RA - improve intersection of Parsonage Road with Route 1 and Route 27 (needs further analysis)		RA - widen Parsonage Road (needs further analysis)

Corridor-wide Problems
Problem IV

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
School Buses on Arterials			
RA - reschedule school starting time to avoid peak periods			
Increasing School Children Pedestrian Volumes			
RA - same as above			
RA - better control of crossing locations use only a few selected crossings			

Minor Corridor

Phase I	Phase II	Phase III	Phase IV
Implementation Potential	Implementation Potential	Implementation Potential	Implementation Potential
6 - 18 Months	12 - 30 Months	24 - 36 Months	36 Month initial const. 36+ Month Completion

Milltown Road
North Brunswick

RA - trucks directed to use Livingston Ave. only - South of How Lane to obtain access to Route 1 North

RA - no through truck movement allowed on Livingston Avenue North of How Lane

RA - no truck traffic on Milltown Road in peak periods

RA - no through truck monvments on Hermann Road

R - improve signing & striping along Milltown Road between Georges Road and Route 1 overpass- better directional signing, lane control, etc.

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION

Milltown Road
North Brunswick

R - recommend van&/or car pooling to large industries capacity in area to initiate these programs

R - recommend staggered hours or flex time operation to other industries who can not initiate pooling programs

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Milltown
Ochs Avenue/Booream Avenue Intersection

R - ban parking on approaches (at least during peak periods)

RA - actuated signal installation

R - geometric improvement-improve turning radius of southeast corner (only with other physical improvements)

R - cutback southwest corner to realign jog of intersection

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
Washington Avenue			
R - retime light for three (3) phase signal operation with variable timing for peak periods	RA - lag arrow for South bound traffic on Washington Avenue with demand actuated left turn signalization		
Kuhlthau Avenue			
R - change timing - less green on Kuhlthau	R - install demand actuated signal;improve turning radius on southwest corner and increase sight distance	RA - ban left turns onto Kuhlthau from Milltown during peak	
Ryder's Lane			
R - three (3) phase signal timing R - make off-angle side street one way west onto Milltown Road	R - geometric improvement - close side street, off-angle exit		

I: SIGNAL TIMING, STRIPING AND SIGNING	II: SIGNAL HARDWARE IMPROVEMENTS GEOMETRIC IMPROVEMENTS	III: SOMEWHAT MORE CAPITAL INTENSIVE MINOR CONS.	IV: CAPITAL CONSTRUCTION
	Along Corridor Within Milltown		
R - ban parking on Milltown Road (provide off-street lots)	R - develop three (3) travel lanes with middle reversible lane to be used with peak flow		
R - ban parking during peak periods			
RA - consolidate school crossing areas to reduce pedestrian conflicts in the peak			
RA - reschedule school starting times to avoid peak periods			
R - reschedule goods deliveries to avoid peak period congestion			
RA - disallow the through movements of goods carriers on Milltown Road			
R - recommend van&/or car pooling to large industries capacity in area with capacity to initiate these programs			
R - recommend staggered hours or flex time operation to other industries who can not initiate pooling programs			

PHASE I IMPLEMENTATION POTENTIAL 6 - 18 MONTHS	PHASE II IMPLEMENTATION POTENTIAL 12 - 30 MONTHS	PHASE III IMPLEMENTATION POTENTIAL 24 - 36 MONTHS	PHASE IV IMPLEMENTATION POTENTIAL 36 MONTH INITIAL CONST. 36+ MONTH COMPLETION
East Brunswick **Old Bridge Turnpike/Milltown Road/Main Street**			
R - improved roadway identification signification signing and directional signing		R - widen out intersections for turning lnaes - left turns lanes at all three (3) intersections	
Along Corridor Within East Brunswick			
R - improve signing and striping - traffic lanes are generally poorly marked and signing is substandard			
South River **Jackson Avenue**			
RA - this is an unwarranted and improper signal; installation should be removed and replaced with a STOP sign on Jackson R - left turns should be banned from Jackson Avenue during the peak periods			

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion

Ferry Street

R - left turns from Ferry Street should be banned during the peak periods

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Along Corridor Within South River

R - parking should be banned during the peak periods

R - along the north side of Main Street between the hours of 7-9am

R - along the south side of Main Street between the hours of 4-6pm (last would allow for two lanes of traffic in the peak direction)

R - better roadway identification signing and directional signing is needed on Main Street

Phase I Implementation Potential 6 - 18 Months	Phase II Implementation Potential 12 - 30 Months	Phase III Implementation Potential 24 - 36 Months	Phase IV Implementation Potential 36 Month initial const. 36+ Month Completion
	Along Corridor Within South River		
R - recommend van&/or car pooling to large industries in area with capacity to initiate these programs	R - off-street parking facilities should be expanded where possible to allow for total ban of parking in downtown CBD area with improved pedestrian crossings in this area		
R - recommend staggered hours or flex time operation to other industries who cannot initiate pooling programs			

Routes to serve industry.

1. Peak hour Middlesex #8 and Suburban Transit Princeton-Dunellen buses to serve Kilmer Industrial Area.

   In a.m. peak - buses from New Brunswick RA
   In p.m. peak - buses to New Brunswick RA

2. Peak hour TNJ #134 buses, both directions, rerouted to serve Talmadge Road industrial center. RA

3. Reroute peak hour TNJ 62-134 buses (or extend from Iselin origin point) to JFK Hospital. Both directions should be rerouted. RA

4. Reroute TNJ 12-58 peak hour buses to serve Squibb, J&J Permacel, and Cook College area. Both directions should be rerouted. RA

Routes to serve activity centers:

1. End the following buses on the Rutger's College Avenue Campus in New Brunswick: RA

   Middlesex 14
   Bayview Woodbridge - New Brunswick
   TNJ 4 & 134 RA

2. Have the following bus routes pass the Rutger's College Avenue Campus:

   TNJ 12-58, 60-135 RA

3. Extend the Middlesex 14 to a new terminal point at Brunswick Shopping Center. RA

4. Reroute TNJ 62 -134 buses to serve JFK Hospital during peak visiting hours. RA

Schedule the following buses as feeder lines to the following R.R. stations:

New Brunswick Station: RA

TNJ/4,12 - 58, 60 - 135
Middlesex 8, 14, 18
Bayview Woodbridge - New Brunswick line

Edison Station: RA

Suburban Transit Princeton - Dunellen line
Extend Middlesex #8 to serve this station in peak hours

Metuchen Station: RA

Plainfield #20
TNJ 4, 62-134
Suburban NY - South Plainfield Bus

Metropark: RA

Extend 62-134 from Iselin terminal to have this as its terminals. Especially in peak hour.

APPENDIX C

TRANSIT INFORMATION

BUS COMPANIES SERVING MIDDLESEX COUNTY

COMPANY	TYPE OF SERVICE	TOWNS PRIMARILY SERVED
Lincoln Transit	NY Commuter	Old Bridge East Brunswick Spotswood Jamesburg
Suburban Transit	NY Commuter	New Brunswick North Brunswick South Brunswick East Brunswick Monroe Dunellen Piscataway South Plainfield Edison Metuchen Woodbridge
Bayview Bus Company	Local Service	New Brunswick East Brunswick Sayreville Old Bridge South Amboy Perth Amboy Woodbridge
Middlesex Bus Company	Local Service	New Brunswick East Brunswick Old Bridge Highland Park Edison
Starr Transit	Local Service	New Brunswick North Brunswick South Brunswick Cranbury
Plainfield Transit	Local Service	Metuchen Edison South Brunswick
Somerset Bus Company	NY and Newark Commuter Service	Middlesex Dunellen Piscataway

COMPANY	TYPE OF SERVICE	TOWNS PRIMARILY SERVED
Transport of NJ	All types of Service	All towns except: South Brunswick Cranbury Plainsboro
Rutgers Campus Bus	Intercampus College Service	New Brunswick Piscataway

BAYVIEW BUS COMPANY

BASE FARE OR ANY SINGLE ZONE	REGULAR	HALF
Any single zone	45¢	20¢
Any 2 consecutive zones	60¢	30¢
Any 3 consecutive zones	65¢	30¢
Any 4 consecutive zones	70¢	35¢
Any 5 consecutive zones	75¢	35¢
Any 6 consecutive zones	80¢	40¢
Any 7 consecutive zones	85¢	40¢
Any 8 consecutive zones	90¢	45¢
Any 9 consecutive zones	95¢	45¢

MIDDLESEX BUS COMPANY

BASE FARE ON ANY SINGLE ZONE	REGULAR	HALF
Any single zone	45¢	20¢
Any 2 consecutive zones	60¢	30¢
Any 3 consecutive zones	70¢	35¢

A zone is usually defined by municipal borders.

ROUTES SERVING THE STUDY CORRIDOR

COMPANY	ROUTE	SERVICE BETWEEN	VIA
TNJ	12-58	New Brunswick-Milltown-South River	Main St./Milltown Road
	134	New Brunswick-Woodbridge Center	Rt.27/Rt.1
	135	New Brunswick-NY City	Rt.27
	4	New Brunswick-Metuchen-Perth Amboy	Rt.27-Woodbridge Ave.-Amboy Avenue
Plainfield Transit	20	South Plainfield-Menlo Park Mall	Amboy Ave./Rt.1

COMAPNY	ROUTE	SERVICE BETWEEN	VIA
Suburban Transit		Princeton-New Brunswick-NYC	Rt.27 & Rt. 1
		South Plainfield-Metuchen-NYC	Amboy Ave.-Rt.1
		Princeton-New Brunswick-Dunellen	Rt. 27-Stelton Rd.
Bayview Bus		Woodbridge-New Brunswick	Rt.18
Middlesex Bus	8	New Brunswick-Edison	Rt. 27
	14	New Brunswick-North Brunswick	Livingston Ave.
	18	New Brunswick-Old Bridge	Rt.18
Starr Transit		New Brunswick-Highstown	Rt.130-Georges Rd.
Rutgers Campus Bus		All Rutgers Campuses	Various Streets

FOOTNOTES

FOOTNOTES

CHAPTER I

1. 1973 Street and Road Map of Middlesex County Issues by the Board of Chosen Freeholders of Middlesex County.

2. Ibid.

3. General Statistics for Middlesex County, published by the Middlesex County Planning Board, April 1978, page 17.

4. The following statistics (Section2: Demographics and Commuter Statistics) were taken from two main sources: "Middlesex County on the Move", 1976 Annaul Transportation Report and "General Statistices for Middlesex County", April 1978-both documents were prepared by the County Planning Board.

5. Highway Inventory and Analysis (document #10) of the Middlesex County Comprehensive Master Plan, prepared by the Middlesex County Planning Board in June 1969 (second printing: 1975); page 24

6. Ibid.

7. Ibid.

8. Ibid, page 14

9. Ibid, page 27

10. Tri-State Regional Planning Commission Interim Technical Report

CHAPTER 2

1. Transportation Coordinating Committee (TCC):

The TCC consists of public and private interests who serve as the advisory body on transportation plans and programs to the Board of Chosen Freeholders. There are 63 members on the TCC, which was convened to conform to federal requirements for broad public and local input to the project planning and implementation process. The TCC also coordinates the development of the County Transportation Plan and five year TIP.

CHAPTER 5

1. Highway Inventory and Analysis. Op Cit.: page 79

2. See Chapter 11 - N.J. DOT Bureaus and Divisions Organizational chart.

CHAPTER 6

1. Evaluation of Transportation Systems Management Strategies for Middlesex County, New Jersey, prepared by Urbitran Associates, October 1978, page 13.

2. Ibid, Executive Summary, pp.1-8

CHAPTER 11

1. U.S.C. Title 23, Ch. 1, Part 450, Sec. 116 (for complete text of regulation, please see Federal Register, Vol. 40 No.181, September 17, 1975, pp. 42976-84.

2. U.S.C. Title 23, Ch.1, Part 450, Sec. 122 appendix.

3. Ibid.

4. The following set of recommendations are taken from "TSM and the Metropolitan Planning Organizations", a paper by Jeffrey T. Hammamd, Dr. Edgar M. Horwood, prepared for UMTA Seminars on TSM Problems, Progress, and Prospects, held on June 12-13, 1978 at University of Washington at Seattle, pp. 29-30.

5. U.S.C. , Title 23, Ch. 1, Part 450, Sec. 122 appendix.

6. Op Cit "TSM and Metropolitan Planning Organization", page 18.

7. "Traffic Control of Car Pools and Buses on Priority Lanes on I-95 in Miami, August 1977, Report No. FHWA-RD-uu-148, page 104.

8. U.S.C., Title 23, Ch.1, Part 450, Subpart C, Sec. 300-320.

NOTICE

DOT-I-82-7